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(16) Special Flood Hazard Report. Greater Anchorage Area. Campbell Creek.

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ORIGINAL CONTAINS COLOR PLATES: ALL DDC REPRODUCTIONS WILL BE IN BLACK AND WHITE

Corps of Engineers Anchorage, AK
Alaska District

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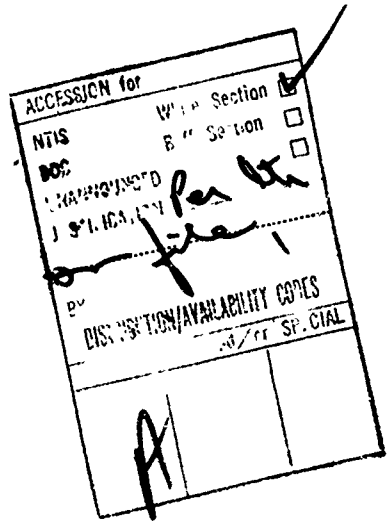

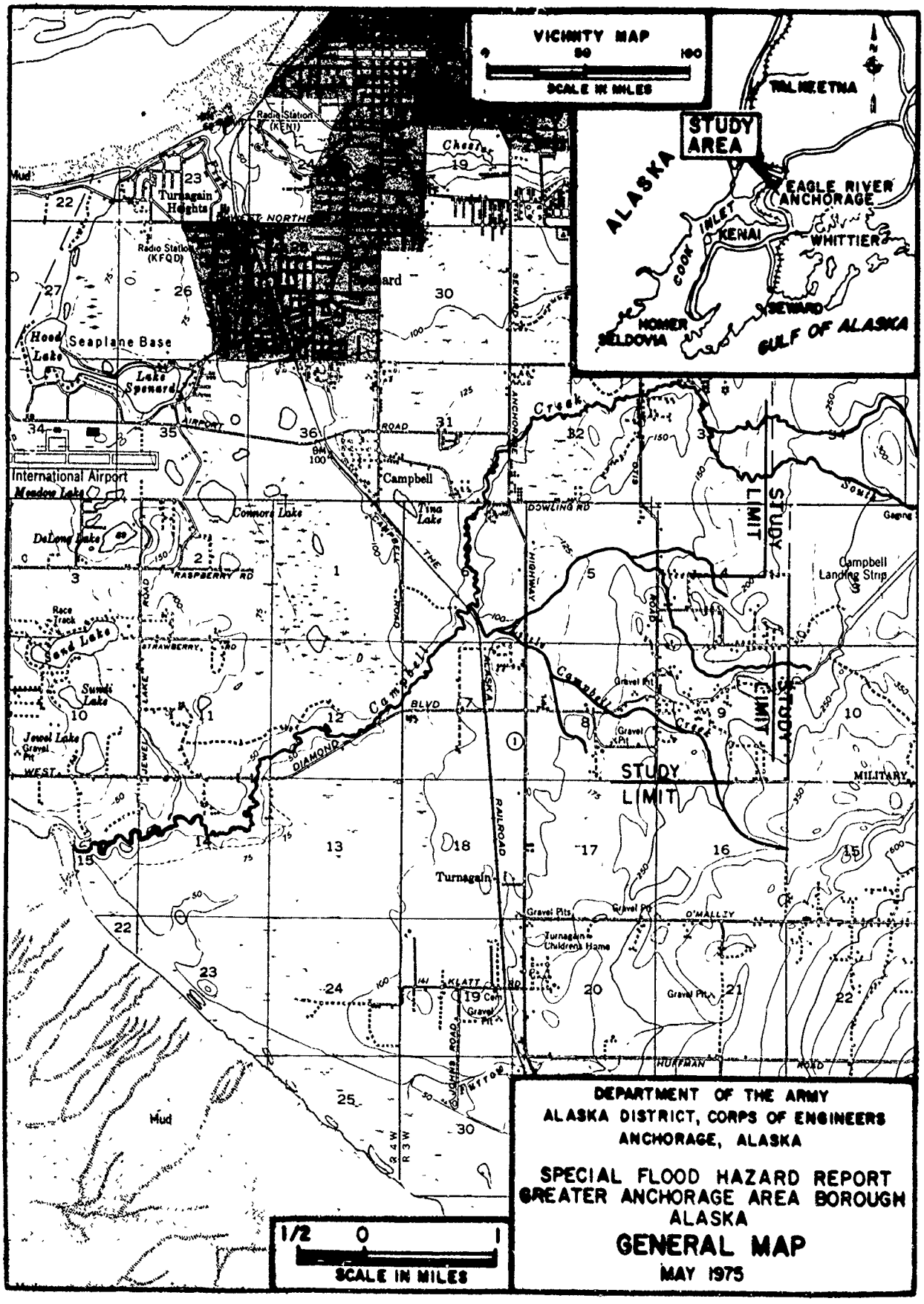
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DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA
SPECIAL FLOOD HAZARD REPORT
GREATER ANCHORAGE AREA BOROUGH
ALASKA
GENERAL MAP
MAY 1975

PLATE I

ABSTRACT

PREFACE

The portion of the Greater Anchorage Area Borough covered by this report is subject to flooding from Campbell Creek. The properties along this stream are primarily residential and have been damaged by past floods. The open spaces in the flood plains which are now under pressure for future development are fairly limited. Although large floods have occurred in the past, studies indicate that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning flood plain utilization. It includes a history of flooding along Campbell Creek and identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, profiles and cross sections. The report does not provide solutions to flood problems, however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of loss and damage. It will also aid in the identification of other flood damage reduction techniques such as works to modify flooding and adjustments, including flood proofing, which might be embodied in an overall Flood Plain Management (FPM) program. Other FPM program studies--those of environmental attributes and the current future land use role of the flood plain as part of its

surroundings--would also profit from this information.

At the request of the Greater Anchorage Area Borough (GAAB) and with the endorsement of the State of Alaska, Department of Natural Resources, this report was prepared by the Alaska District, Corps of Engineers under continuing authority provided in Section 206 of the 1960 Flood Control Act, as ammended. This report supersedes the previously published reports by the Corps of Engineers on Campbell Creek, as shown in the following list:

Title of Report	Date
Campbell Creek Flood Plain Information Report	June 1968
Special Flood Hazard Report, GAAB	March 1971
Special Flood Hazard Report, GAAB	April 1972

Assistance and cooperation of the National Weather Service, U. S. Geological Survey, Alaska Disaster Office, and private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the Greater Anchorage Area Borough. The Alaska District, Corps of Engineers, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented, as well as planning guidance and further assistance, including the development of additional technical information.

BACKGROUND INFORMATION

Settlement

The Greater Anchorage Area Borough, consisting of approximately 1,500 square miles, and with a present population estimated at over 162,500, is the most heavily populated area in the State of Alaska. The borough was formed in 1964 to provide a regional government for the entire "Anchorage Bowl", including the outlying areas. There are several drainage areas and tidal benches within the borough that have a flood plain. This report covers Campbell Creek area from Turnagain Arm to where the north and south forks of Campbell Creek and Little Campbell Creek enter the foothills of the Chugach Mountains.

Anchorage had its beginning in the early 1900's when the United States Congress authorized the construction of a railroad to permit access from the coastal areas of the state into the vast and rich interior of Alaska. The community of Anchorage was formally established in 1913, when a party of surveyors landed at the mouth of Ship Creek to commence work on the federally-owned Alaska Railroad. The town, first called Ship Creek Landing, consisted of a construction camp to accommodate the railroad construction effort.

Within a year, the railroad workers and the merchants who had come north to serve them had outgrown the site in Ship Creek valley and moved to the townsite on the bluff south of the creek. The new townsite took the name "Anchorage" from the fact that ships could anchor at the mouth of Ship Creek. Anchorage grew very rapidly from a population of 1856 in 1920 to its present population.

As the community grew from its early beginnings to the modern city that it is today, people began to develop the outlying areas, primarily for residential purposes. Today, the areas adjacent to Campbell Creek are in a state of rapid development. Land is continually being subdivided and developed as the Anchorage area population grows and requires additional space. This results in an increased tendency to encroach upon the flood plains of Campbell Creek and other local streams.

The Stream and Its Valley

Campbell Creek, with a drainage area over 74 square miles at its confluence with Turnagain Arm, has its headwaters at the edge of the Chugach Mountains.

The gradient of the stream is relatively steep in the upper reaches, but flattens considerably as the stream flows to salt water. These flatter gradients in the lower reaches are not conducive to extensive bank erosion, but are contributing factors to major overbank flooding.

The portion of Campbell Creek included in this study is shown on the general map, Plate I. Drainage areas contributing to runoff in or near the study areas are shown in Table 1.

TABLE I

DRAINAGE AREAS

Location	River Mile	Drainage Area Sq. Mile
Campbell Creek at Dimond Blvd.	2.8	69.7
South Fork Campbell Creek at mouth	9.2	30.4
North Ford Campbell Creek at mouth	9.2	14.0
Little Campbell Creek at mouth	5.6	12.6

The climate of the area can be compared to sections of the western mountain and north central regions of the United States. It is characterized by moderately warm summers and cold winters with temperature extremes ranging from 86°F to 38°F below zero. Annual precipitation for Anchorage averages over 14 inches and annual snowfall 76.4 inches.

Developments in the Flood Plain

The portions of Campbell Creek included in this study are the main stem, the north and south forks to the military reservation boundary, and Little Campbell to the foothills of the Chugach Mountains. In the study area, the main stem and the north and south forks flow generally to the west, meandering through regions where subdivisions and trailer parks abound. There is high ground on both sides of the stream which provides safe building areas. However, many residential structures

have been constructed adjacent to the stream in the flood plain. Due to the rapid development in the foothills of the drainage area, increased danger of flooding will occur as the vegetation that formerly slowed the natural runoff process is removed, the area ditched and storm sewers and culverts installed, thus allowing a more rapid runoff and increasing the amount of flow in the main channel and tributaries of Campbell Creek. In addition, formerly rather damp and swampy areas are now being developed for real estate purposes. In recent years, drainage ditches have been excavated in the flood plain to lower the water table, thereby enabling the ground to drain enough to construct foundations and cesspools in new housing developments. When floods occur, these drainage ditches fill, the water table rises and cesspools overflow, creating not only damage from high water but general health hazards to all those living in the flood plain area. Probably most affected would be private homes and small commercial establishments. The expansion trend of the Anchorage area is toward Campbell Creek because of favorably topography and accessibility. Portions of the flood plain have been purchased and designated as a greenbelt area for recreational development, such as riding trails, foot paths, dog racing areas, picnic grounds, etc. Parts of the green belt have been inundated by floods in the past, and a substantially greater area is within reach of the potentially larger floods of the future.

Although the present development along Campbell Creek varies from light to heavy, the area is growing very rapidly and greatly increased development can be anticipated if the present trend continues. As this development occurs in the Anchorage area, the flood plains are being encroached upon, and each flood could result in heavier losses. Flood hazard information and reasonable regulations can be used to guide and control use of flood prone areas and thus minimize future flood damages. Such controls have been adopted in many localities and have become accepted as a practical approach to safe development and prevention of flood disasters. The adoption of flood plain regulations would not prevent the use of the area for parks or other open type facilities.

Corrective measures may include flood-proofing to make existing and proposed structures less vulnerable. This involves temporary or permanent closure of lower openings on structures, using flap valves on sewer openings, waterproofing walls and floors, and other similar measures.

FLOOD SITUATION

Source of Data and Records

Records of stream flows on Campbell Creek have been maintained since 1947, when the U.S. Geological Survey began keeping records using a stream gage on the south fork of Campbell Creek near Campbell air strip. During the fall of 1966, another gage was installed on Campbell Creek at the Dimond Boulevard crossing. Continuous records for both stations are available.

To supplement the records of the gaging stations, newspaper files, historical documents and records were searched for information concerning past floods. In addition, the stream flow records were correlated with the gaging records on other streams in the immediate area. From these records and investigations and from studies of possible future floods on Campbell Creek the local flood situation, both past and future, has been developed.

Maps used for this report were provided by the Greater Anchorage Area Borough (GAAB) and were prepared from aerial photographs taken in October 1973. Stream cross sections and data on bridges and culverts were obtained by field surveys by or for the Alaska District, Corps of Engineers.

Flood Season and Flood Characteristics

High flows have occurred in the study area during all seasons. Winter and spring, however, are the primary seasons in which flooding problems occur. Winter floods may result from glaciation where the water will freeze down to the stream bed during extremely low temperatures, forcing the water on top of the ice. This can continue until the stream bed is higher than the banks, at which time a new water course is formed and flooding occurs. Glaciation at culverts is a frequent cause of winter flooding.

Spring floods may occur as a result of an above-normal snowfall during the preceding winter, followed by an unusually cold spring and then a rapid snowmelt. Floods during summer or fall usually result from a rainfall of high intensity and short duration.

Except for glaciation, floods are of relatively short duration on Campbell Creek. Stream stages can rise from normal to extreme flood peaks in a relatively short period of time.

Factors Affecting Flooding and Their Impact

Obstructions to Floodflows — Natural obstructions to flood flows include trees, brush and other vegetation growing along the stream banks in flood plain areas. Man-made encroachments on or over the stream, such as roads and culverts, can also create more extensive flooding than would otherwise occur.

During floods, trees, brush and other vegetation growing in the flood plain impede floodflows, thus creating backwater and increased flood heights. Trees and other debris may be washed away and carried downstream to collect at culverts or other obstructions. As floodflows increase, masses of debris could break loose and surge downstream until another obstruction is encountered.

The major obstructions to the flood flow on Campbell Creek are the culverts in the study area. Many of the culverts under the major thoroughfares and streets are inadequate to pass major flood flows, thereby causing extensive damage to these roads. As previously mentioned, additional development also increases the possibility of more and faster runoff. One possible solution for this is installation of larger culverts based on possible future developments. It is not always economically feasible, however, to install culverts for future conditions, but because of the flooding possibilities, it should be considered.

Clogging of culverts by debris is a serious matter. All culverts in the area should be checked regularly even during normal runoff periods, as trash such as pieces of plywood, tree branches, logs or just scrap lumber can create a backwater situation. The construction and installation of trash racks just upstream of the culverts has proven very effective, as this allows a less restricted area for water to pass. It is also much easier to remove debris at the trash racks than at a plugged culvert. Winter glaciation, however, must be considered in the design of these trash racks.

It should be the duty of the responsible governing body, whether it be city, borough or state, to make regular inspections of all culverts and trash racks to remove debris, stepping up the number of inspections during heavy runoff periods.

In general, obstructions restrict floodflows and result in overbank flows and unpredicatable areas of flooding, possible destruction of any bridges or culverts and an increased velocity of flow immediately downstream. Since it is impossible to predict the degree or location of the accumulation; it was necessary for the purposes

of this report to assume that there would be no accumulation of debris along the stream or at any of the culverts.

Flood Damage Reduction Measures — There are no existing flood control structures on Campbell Creek. However, emergency measures such as pumping, installation of larger culverts, etc., have been taken during times of spring breakup to take care of the immediate need. There are no existing borough zoning ordinances, building codes or other comprehensive regulating measures specifically for the reduction of flood damage. A zoning ordinance has been proposed and drawn up by the borough, but no positive action has been taken on it yet. This study has been requested so that it may be used as a basis for the development of flood plain management measures by the GAAB.

Flood Warning and Forecasting Services — Specific river forecasts are not feasible for drainage areas as small as that of Campbell Creek. However, the National Weather Service, Alaska River Forecast Center, located in Anchorage, will issure flood warnings when rainfall of high intensity occurs. The flood warnings will be disseminated to the public by commercial radio and TV stations and by Radio Station KEC-43 on a frequency of 162.55 mhz. Weather warnings and forecasts are also issued by the National Weather Service over the same communications facilities.

Flood Fighting and Emergency Evacuation Plan — Although there are no formal flood fighting or emergency evacuation plans for the Campbell Creek area, provisions for alerting area residents in time of emergency are accomplished by the Alaska Disaster Office through the GAAB. This office maintains communication with the National Weather Service at its control center, establishing a "flood watch" during the early stages of flood threat. Residents along the stream are warned by radio and telephone of approaching flood conditions. Subsequent flood fighting, evacuation and rescue activities are coordinated on a borough-wide basis with borough officials.

Material Storage on the Flood Plain — Due to the nature of the development along Campbell Creek, there are no significant quantities of floatable materials stored in the flood plain. If they are present, they could be carried away by flood flows, causing serious damage to structures downstream.

PAST FLOODS

Summary of Historical Floods

Very little information is available concerning historical floods on Campbell Creek. Research of the flood history was conducted to obtain information of Campbell Creek along its route from the foothills of the Chugach Mountains to its confluence with Turnagain Arm. Records of past floods, however, are very meager and, in some cases, non-existent. The November 1965 flood was the greatest known flood of record that has occurred on Campbell Creek. Although there were few newspaper reports and a very limited number of residents who recall the results of that flood, the same flood today would draw considerable attention because of the rapid growth of the area. Numerous other floods have been recorded in past years, the most recent being in August 1971. Many of these floods were due to ice conditions that caused backwater effects. Additional information on historical floods was obtained from interviews with residents along the stream. Field investigations and office computations supplemented what data were available and were used to develop the flooded area maps in this report.

Flood Records

Residents who had experienced damage, or who had experienced flood flows, were interviewed in an effort to obtain information on past floods. Persons interviewed recalled in several seasons when the creek glaciated in winter or early spring and flowed out of its banks. The Corps of Engineers has furnished sandbags in past years to protect homes. The Abbott Loop School has been endangered, on occasion, by glaciation in past years.

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past will occur in the future. Larger floods nave been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall and runoff which caused these floods could occur in the Campbell Creek area. Therefore, to determine the flooding potential of the study area, it was necessary to consider storms and floods that have occurred in regions of similar topography, watershed cover and physical characteristics. Discussion of future flood damage and the delineation of flooded areas has been limited in this report to that flood which has been designated as the Intermediate Regional Flood.

Intermediate Regional Flood

The Intermediate Regional Flood (IRF) is defined as one that will occur once in 100 years, on the average, although it could occur in any year. The peak flow of this flood was developed from a statistical analysis of streamflow and precipitation records and a study of runoff characteristics; however, limitations in Campbell Creek basin data required analysis on a regional rather than a watershed basis. In determining the Intermediate Regional Flood for Campbell Creek, statistical studies were made using flood data from National Weather Service climatological stations in the vicinity of Anchorage, Alaska. The effect of urbanization in the Campbell Creek basin was also taken into account in the derivation of the IRF. The peak flows developed for the IRF for various locations in the study area are shown in the following table.

TABLE 2

PEAK FLOWS FOR THE INTERMEDIATE REGIONAL FLOOD
ON CAMPBELL CREEK

Location	Discharge CFS
Dimond Boulevard	1320
Mentra Street	1300
Alaska Railroad	1300
Dowling Road	1120
Seward Highway	1120
Cache Street	1100
Lake Otis Parkway	1100
Junction North & South Forks	1100
Little Campbell Creek	
Nathan Lane	180
Campbell Drive	100
80th Avenue	100
Wells Road	90
Lake Otis Parkway	90
Abbott Loop Road	80
North Fork Little Campbell Creek	
Seward Highway	120
Lake Otis Parkway	40
Abbott Loop Road	30
South Branch, North Fork Little Campbell Creek	
68th Avenue	100
72nd Avenue	80

Frequency

A frequency curve of peak flows was constructed, on the basis of available information, up to the magnitude of the Standard Project Flood. The Standard Project Flood is defined as a major flood that can be expected to occur from a severe combination of meterological and hydrologic conditions that is considered

reasonably characteristic of the geographical area in which the study area is located, excluding extremely rare conditions.

The frequency curve, thus derived, which is available upon request, reflects the judgement of the engineers who have studied the area and are familiar with the region. However, it must be regarded as approximate and should be used with caution in connection with any planning of flood plain use. Floods larger than the aforementioned Standard Project Flood are possible, but the combination of factors necessary to produce such a large flood would be extremely rare.

Hazards of Large Floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise, developments in the flood plain and effectiveness of flood fighting efforts. Floodwaters flowing at high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater three or more feet deep and flowing at a velocity of three or more feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Water lines could be ruptured by deposits of debris and the force of the floodwaters, and wells could be flooded, thus creating the possibility of contaminated domestic water supplies. Isolation of areas by floodwaters could create hazards in terms of medical, fire or law enforcement emergencies.

Flooded Areas and Flood Damages — The areas along Campbell Creek that would be flooded by the IRF are shown on Plates 1 through 28. The actual limits of overflow may vary somewhat from those shown on the maps because the scale of the maps does not permit precise plotting of the flooded area boundaries.

In addition to the limits of the IRF, a hydraulic floodway was added to the maps at the request of the GAAB. This floodway is defined as that area necessary to pass the IRF without causing a rise in water surface of more than one foot above the natural water surface profile for the IRF, or an increase in velocity of more than 20 percent. This floodway considers only the hydraulic requirements and not economic, aesthetic or other values.

On many of the reaches of Campbell Creek, especially on the smaller tributaries, the floodway and the flooded area are essentially the same width and relatively narrow. In cases where stream easements, as specified under GAAB subdivision regulations, exceed the width of either the floodway or the flooded area, the width of the easement was used as the floodway or the limit of the IRF:

Glaciation or winter flooding is a constant and ever-increasing threat and should always be considered before any development near the stream. It is entirely possible for glaciation to extend beyond the limits of the IRF as shown on the plates.

There are many subdivisions within the range of overflow from Campbell Creek. Concentrations of people begin at the foothills where Campbell Creek emerges from the military reservation, and although some of the subdivisions may be distant from the creek itself, flooding occurs because the area is flat. House trailer parking areas downstream are subject to flood damage and health hazards from cesspools and contaminated wells. Immediately downstream from where the north and south forks of Campbell Creek meet to form the main stream, there is considerable residential development along the banks. The homes constructed just west of Lake Otis Parkway, on the banks of the stream, are vulnerable not only to flooding but bank erosion and damage from debris, should a flood occur. The stretch of Campbell Creek downstream of this area is relatively undeveloped until it reaches the vicinity of Dimond Boulevard. The GAAB has wisely purchased, or set aside, many parcels of land along the stream as a green belt. This green belt is being developed by the Parks and Recreation Department as a recreation area which includes bike paths, picnic areas, ball parks, etc.

Plates showing water surface profiles for the IRF have been provided to the GAAB Planning Department. Depth of the flow at specific locations can be determined from these illustrations.

Obstructions — During floods, debris collecting on the culverts and at bridges decrease their carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the culverts were considered. The following tables provide information on the numerous crossings on Campbell Creek.

TABLE 3

STREAM CROSSINGS

On Main Campbell Creek

Location	Culvert Size Bridge Length	Upstream Bed Elev.	IRF Crest Elev.	Road Elev. (for Weir Flow)	Type of Flow	Notes
Dimond Blvd.	21 ft.	16.9	21.8	32.4	Low	
Mentra Street	120" CMP	33.0	41.2	40.5	Low & Weir	2,3
Rovena Street	32 ft.	40.0	44.3	45.0	Low & Weir	3
Arctic Blvd.	50 ft.	47.9	53.3	55.6	Low	
"C" Street	75 ft.	52.3	58.2	69.8	Low	
ARR Bridge	137 ft.	71.4	77.5	94.7	Low	
Dowling Road	30 ft.	90.9	97.8	99.2	Pressure	
	48 ft.	97.7	103.0	100.5	Low & Weir	3
Old Seward	21 ft.	99.5	105.5	111.2	Low	
Peanut Farm	40 ft.	100.5	107.2	107.5	Pressure	
New Seward	60 ft.	112.4	118.4	123.7	Low	
Cache Drive	27 ft.	118.0	124.2	128.4	Low	
Dimond Drive	34 ft.	128.5	134.3	135.8	Low	
Lake Otis Pkwy.	56 ft.	135.3	143.2	142.8	Pressure & Weir	3

On South Fork Little Campbell Creek

E. 76th Avenue	42" Pipe	85.4	89.7	91.0	Pressure	
Old Seward	36" CMP	89.0	91.1	95.6	Pressure & Weir	2,3
New Seward	54" CMP	110.5	115.8	121.2	Low	
Access Road	54" CMP	110.6	117.3	118.6	Pressure	

Notes

1. Culvert Damaged
2. Culvert Inadequate
3. Possible Washout

TABLE 3 (cont)

STREAM CROSSINGS

On South Fork Little Campbell Creek

Location	Culvert Size Bridge Length	Upstream Bed Elev.	IRF Crest Elev.	Road Elev. (for Weir Flow)	Type of Flow	Notes
Hartzell Road	16 ft.	120.8	122.8	125.6	Low	
	30" CMP	130.7	140.3	141.2	Pressure	
E. Diamond Blvd.	24" CMP	160.3	164.8	162.8	Pressure & Weir	1,2,3
	14 ft.	171.0	172.3	173.3	Low	
	24" CMP	175.0	177.8	177.0	Pressure & Weir	2,3
	24" CMP	176.9	179.7	179.5	Pressure & Weir	2,3
Box Culvert	36" X 24"	177.2	180.2	180.7	Pressure	
	24" CMP	178.6	181.2	180.8	Pressure & Weir	2,3
	1-24" CMP 1-15" CMP	180.6	182.6	183.0	Pressure	1,2,3
	30" CMP	180.7	184.3	184.0	Pressure & Weir	2,3
Lake Otis Pkwy	60" CMP	187.4	190.2	194.1	Low	
	2-36" CMP	193.3	196.0	196.4	Low	
Pokey Circle	30" CMP	197.6	200.4	200.0	Pressure & Weir	2,3
E. 84th Avenue	2-36" CMP	198.9	200.2	201.0	Pressure, Low, Weir	1,2,3
Trailer Court	21 ft.	200.6	203.7	204.8	Low	
Abbott Road	36" CMP	231.9	237.8	237.6	Pressure & Weir	2,3
Nathan Drive	48" CMP	75.7	80.9	80.2	Pressure & Weir	2,3
Glade Place	42" Pipe	82.7	88.2	87.2	Pressure & Weir	2,3

Notes

1. Culvert Damaged
2. Culvert Inadequate
3. Possible Washout

TABLE 3 (cont)

STREAM CROSSINGS

Location	Culvert Size Bridge Length	Upstream Bed Elev.	IRF Crest Elev.	Road Elev. (for Weir Flow)	Type of Flow	Notes
On South Fork Little Campbell Creek						
Old Seward	48" CMP	86.3	94.0	95.7	Pressure	
72nd Avenue	48" CMP	93.5	98.7	98.0	Pressure & Weir	2,3
Briarwood Street	48" CMP	96.4	102.1	99.9	Pressure, Weir	3
E. 71st Avenue	2-36" CMP	99.8	104.5	104.2	Pressure & Weir	2,3
	48" CMP	102.6	107.1	106.1	Low, Weir	3
New Seward	1-36" CMP 1-50X31 CMAP	104.6	112.9	116.0	Pressure	
Access Road	1-36" CMP 1-50X31 CMAP	106.0	113.3	112.7	Pressure & Weir	2,3
	30" CMP	139.4	144.6	144.2	Pressure & Weir	2,3
Lake Otis Pkwy	48" CMP	140.5	146.5	147.5	Pressure	
E. 68th Avenue	18" CMP	142.1	148.6	148.0	Pressure & Weir	2,3
E. 72nd Avenue	30" CMP	158.2	162.5	162.0	Pressure & Weir	2,3
	48" CMP	182.3	186.0	186.0	Low	
Stewart Drive	30" Conc.	182.7	187.0	186.4	Pressure & Weir	2,3
Abbott Rd.	36" CMP	208.2	212.0	211.7	Pressure & Weir	2,3
On North Branch of North Fork Little Campbell Creek						
Lake Otis Pkwy	48" CMP	137.2	141.3	145.4	Pressure	
E. 68th Avenue	24" CMP	155.9	160.9	160.6	Pressure & Weir	2,3

Notes

1. Culvert Damaged
2. Culvert Inadequate
3. Possible Washout

Velocities of Flow — Water velocities during floods depend largely on the size and shape of the stream and bed slope, all of which vary on different streams and at different locations on the same stream. During the IRF, velocities of main channel flow range up to 10 feet per second but average much less. Velocities of this magnitude are sufficient to cause erosion to streambanks and the fill around culverts. Velocities of overbank flow vary widely, depending upon location, but generally are less than 3 feet per second.

Rates of Rise and Duration of Flooding — Flood hydrographs indicate that at the present time Campbell Creek is a fairly fast-rising stream which has a tendency to remain high, though not necessarily out of bank, for several days. This tendency is attributed to in part by the swamps and type of areas draining into the creek. As the drainage area develops, housing and improved drainage systems will be installed, resulting in a more rapid runoff. Campbell Creek will then respond more rapidly to intense rain storms and will have a shorter duration of overbank flooding.

GLOSSARY

Backwater. The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood. An overflow of lands not normally covered by water that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Peak. The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

Flood Plain. The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Hydrograph. A graph showing flow values against time at a given point, usually measured in cubic feet per second. The area under the curve indicates total volume of flow.

Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.

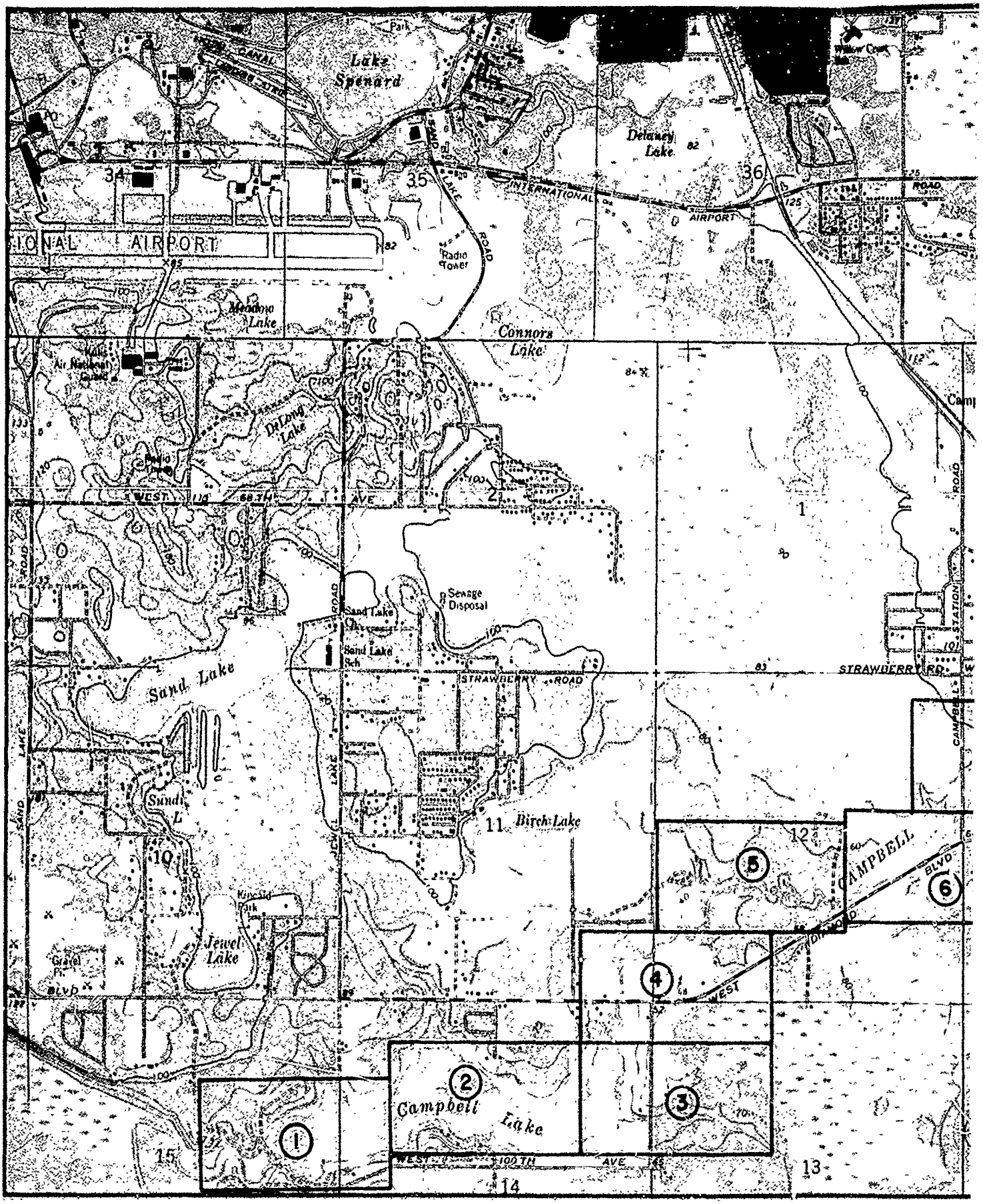
Left Bank. The bank on the left side of a river, stream or watercourse, looking downstream.

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40-60 percent

of the Probable Maximum Floods for the same basins. As used by the Corps of Engineers, Standard Project Floods are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance Elevation. The lowest point of a bridge or other structure over or across a river, stream, or watercourse that limits the opening through which water flows. This is referred to as "low steel" in some regions.


Lake Spenard
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Meadow Lake
Connors Lake
Drying Lake
Sand Lake
Sewage Disposal
Sand Lake Ch
Sand Lake Sch
Birch Lake
Jewel Lake
Campbell Lake
Radio Tower
INTERNATIONAL AIRPORT
AIRPORT ROAD
SAND LAKE ROAD
STRAWBERRY ROAD
CAMPBELL BLVD
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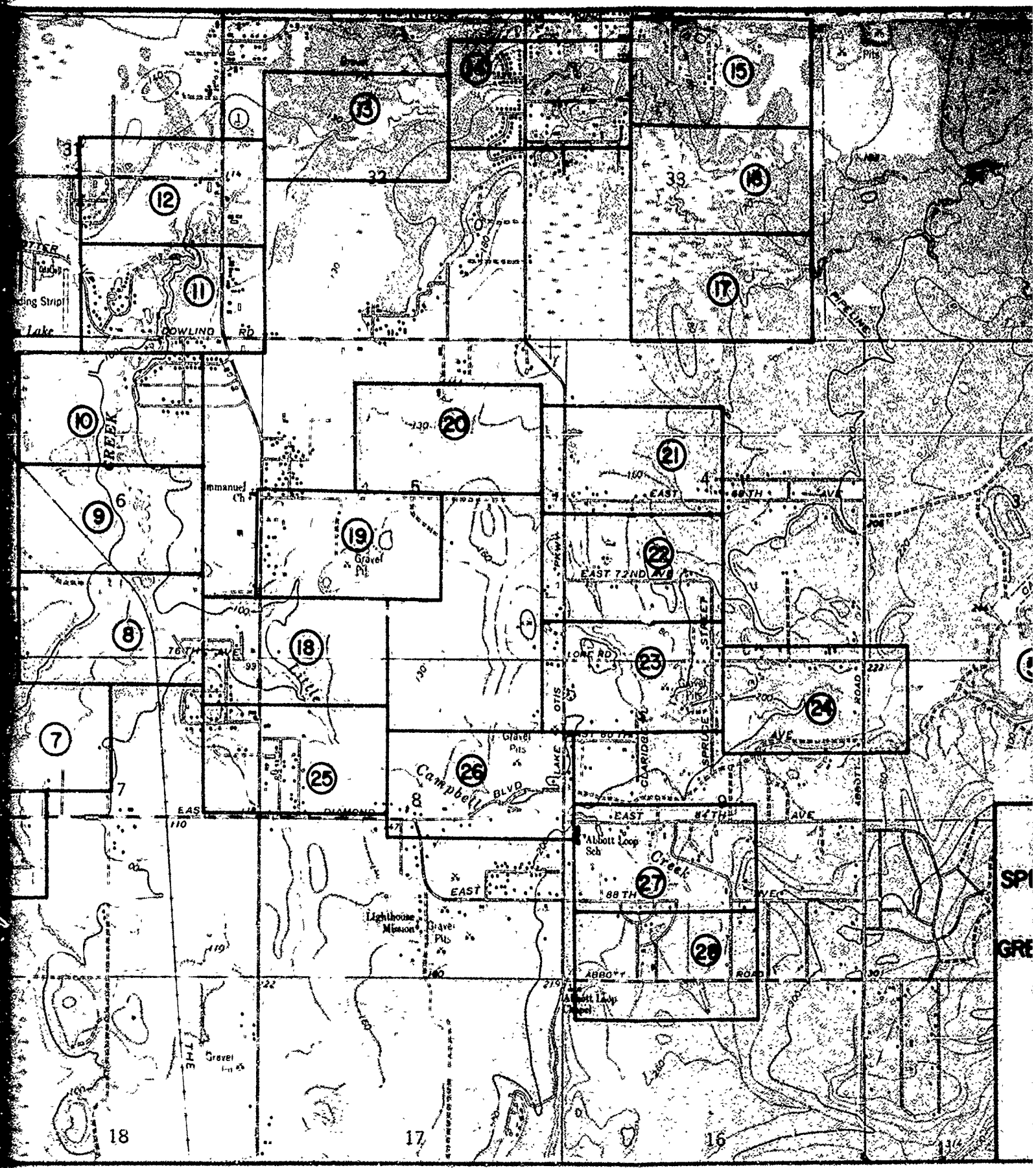
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LAKE
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Abbott Loop Sch
Lighthouse Mission
Gravel Pits
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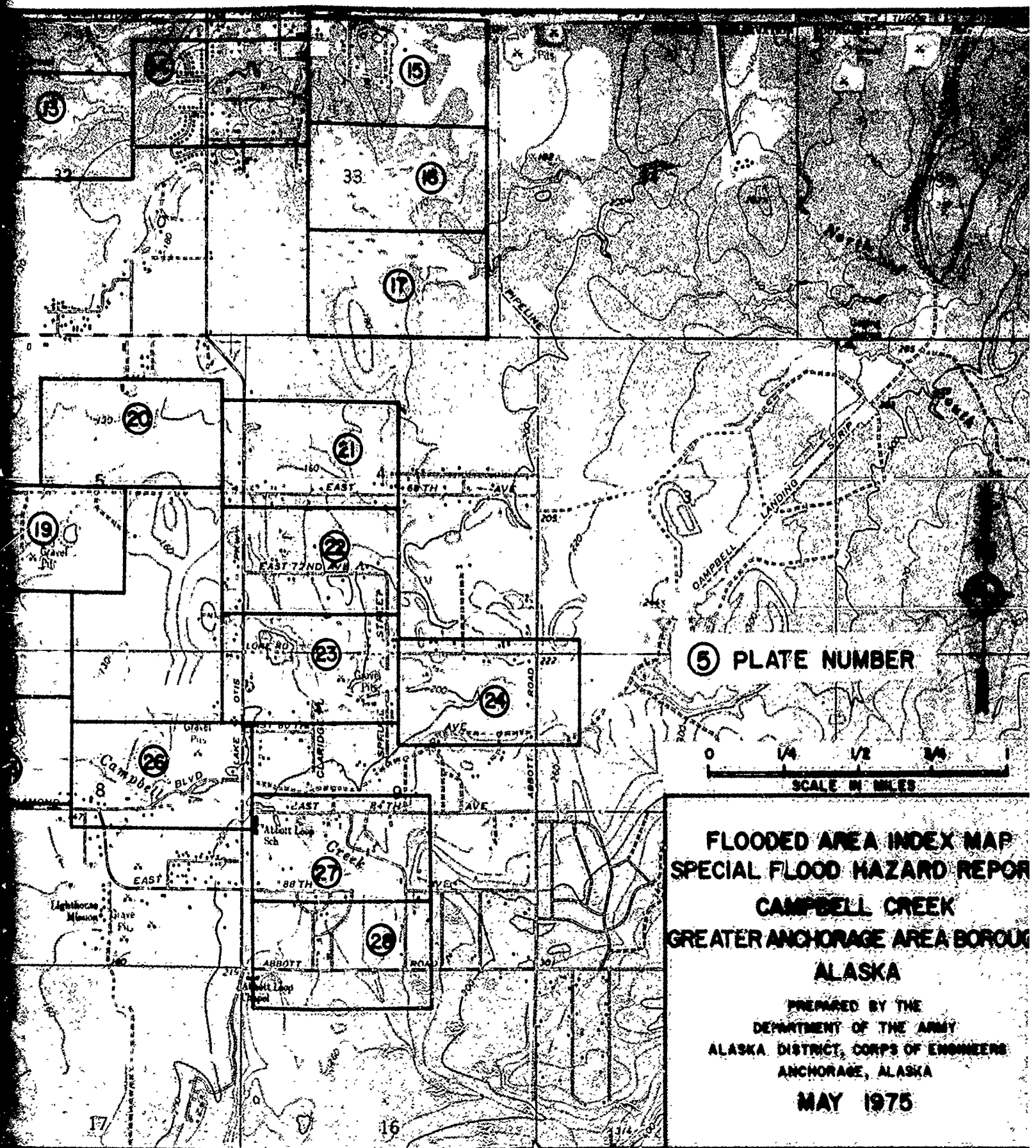
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0 1/4 1/2 3/4 1
SCALE IN MILES
FLOODED AREA INDEX MAP
SPECIAL FLOOD HAZARD REPOR
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUG
ALASKA
PREPARED BY THE
DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA
MAY 1975
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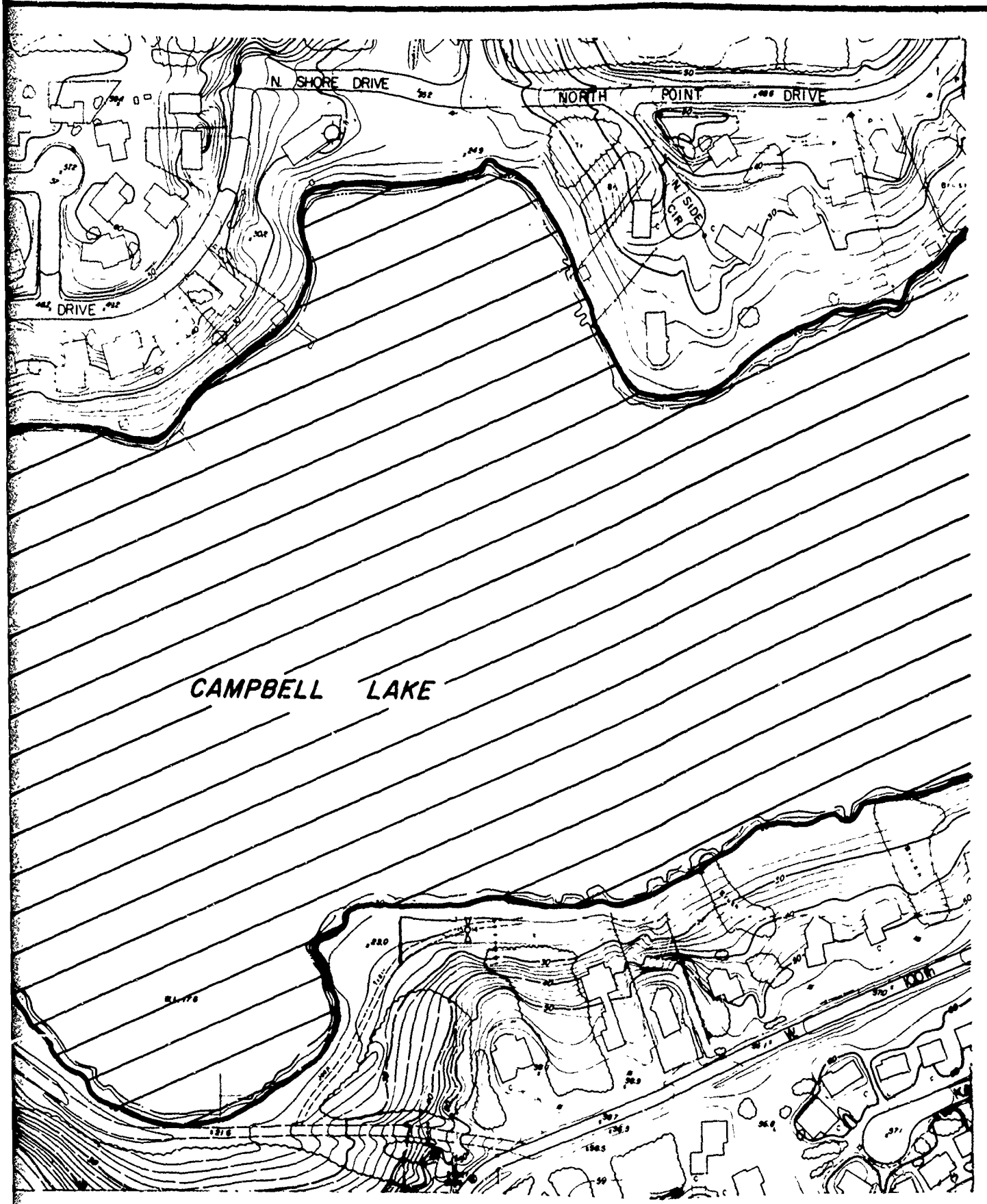
PLATE II



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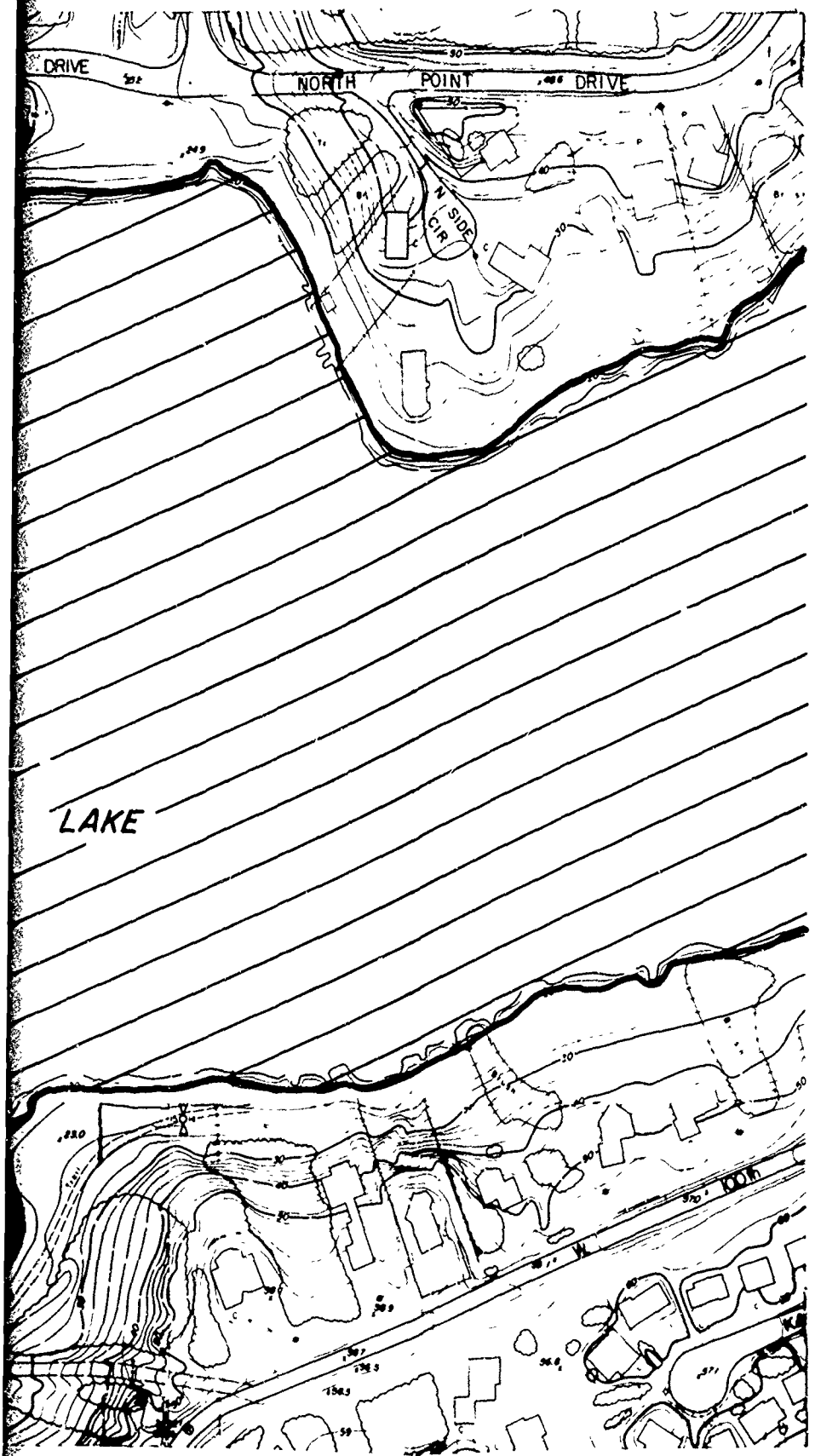

PLATE 2

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS } INTERMEDIATE REGIONAL FLOOD (IRF)

56 — APPROXIMATE WATER SURFACE ELEVATION DURING IRF

—250— GROUND ELEVATION G.A.A.B. POST QUAKE DATUM (MSL 1972)

NOTES

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0' 200' 400'

SCALE IN FEET

FLOODED AREA MAP
SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

PREPARED BY THE
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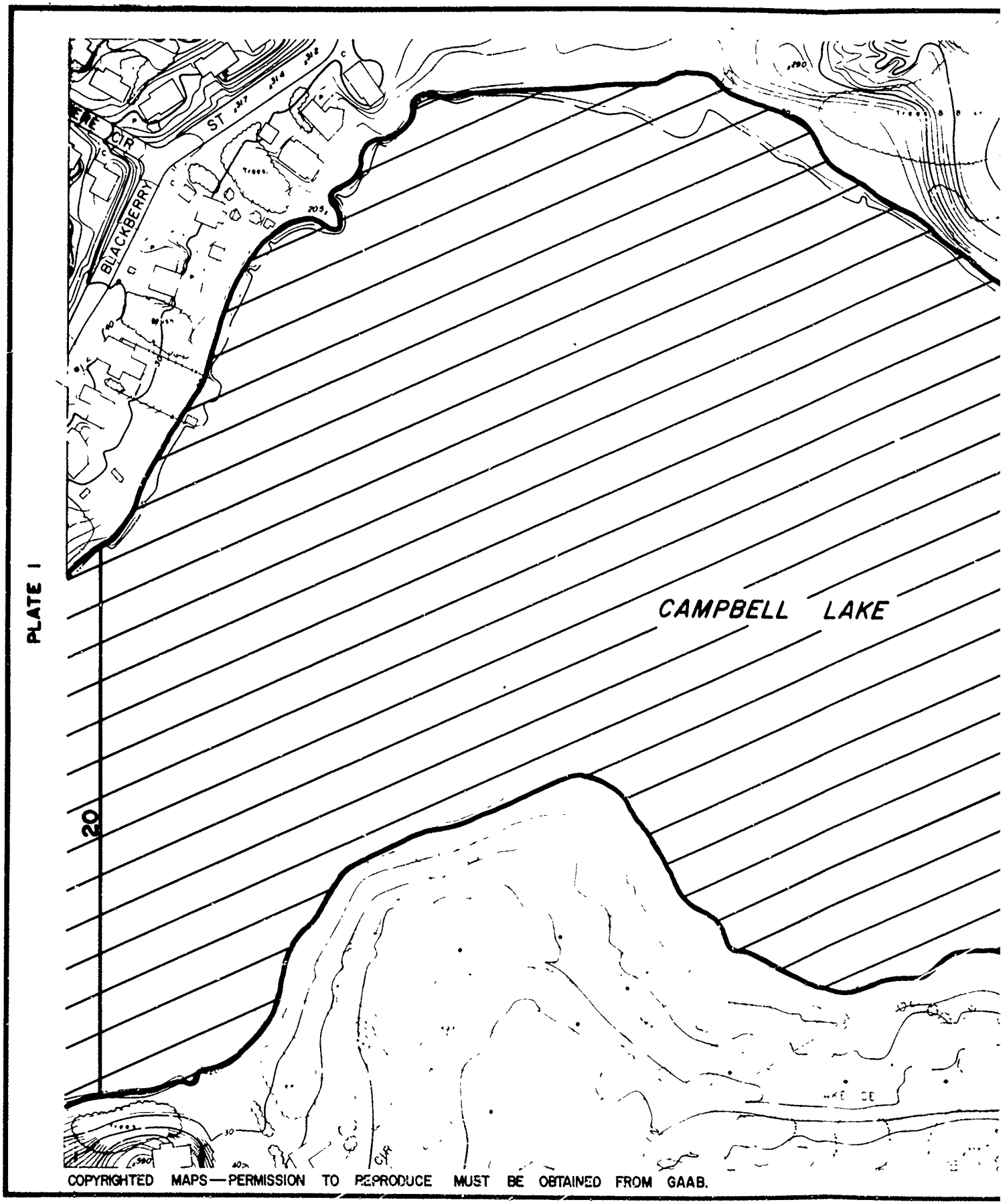
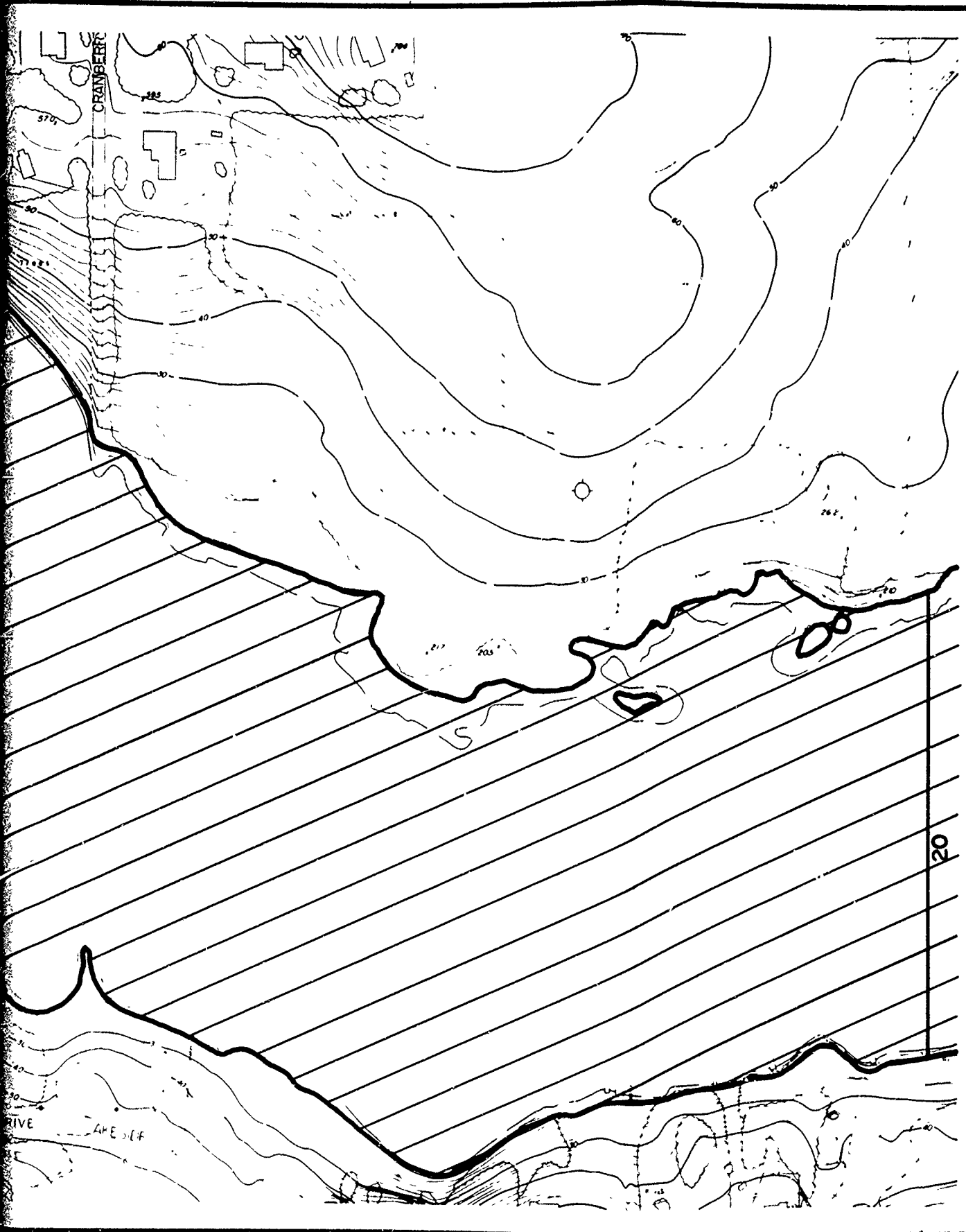
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA

MAY 1975

PLATE 1





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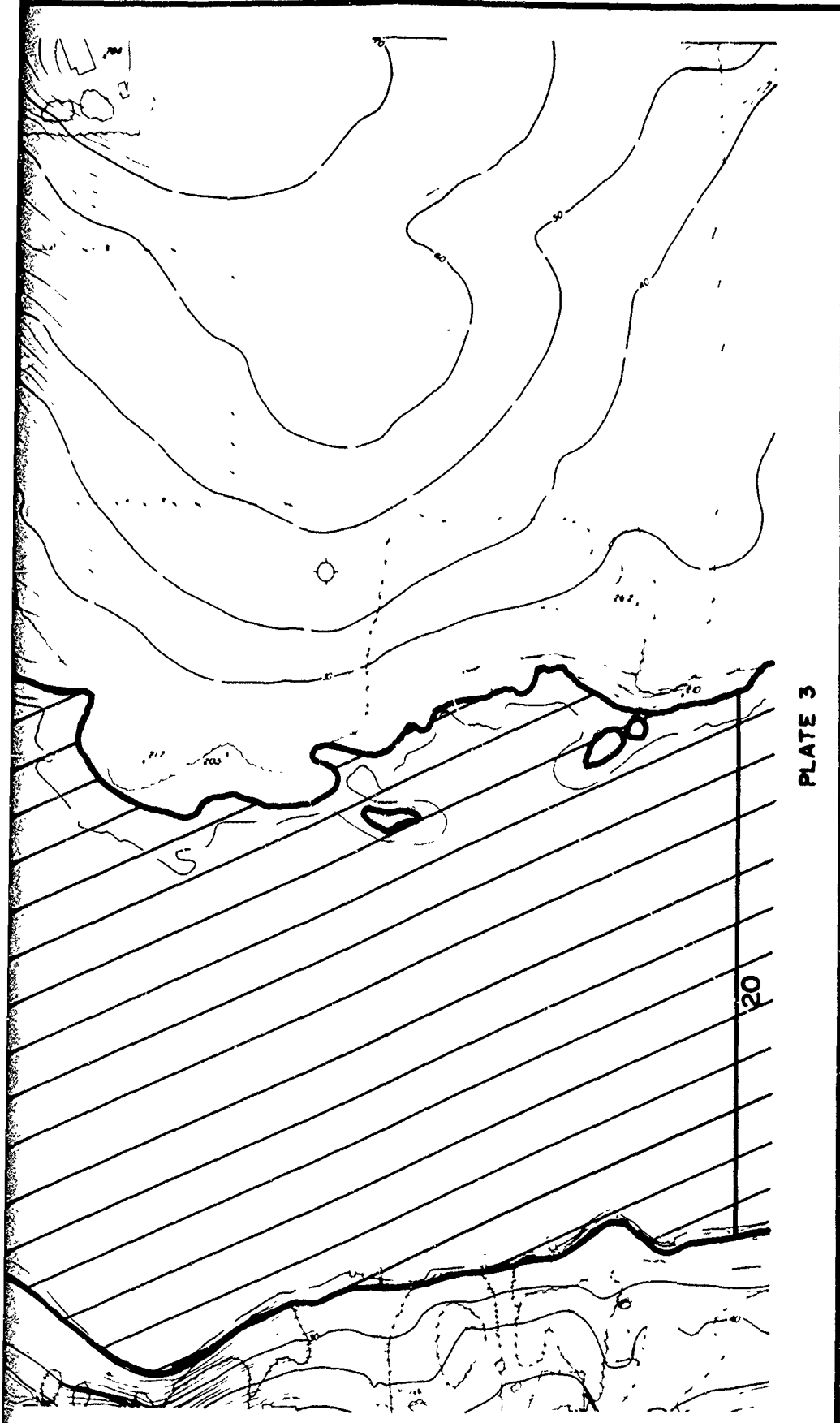

LEGEND

OVERFLOW LIMITS

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SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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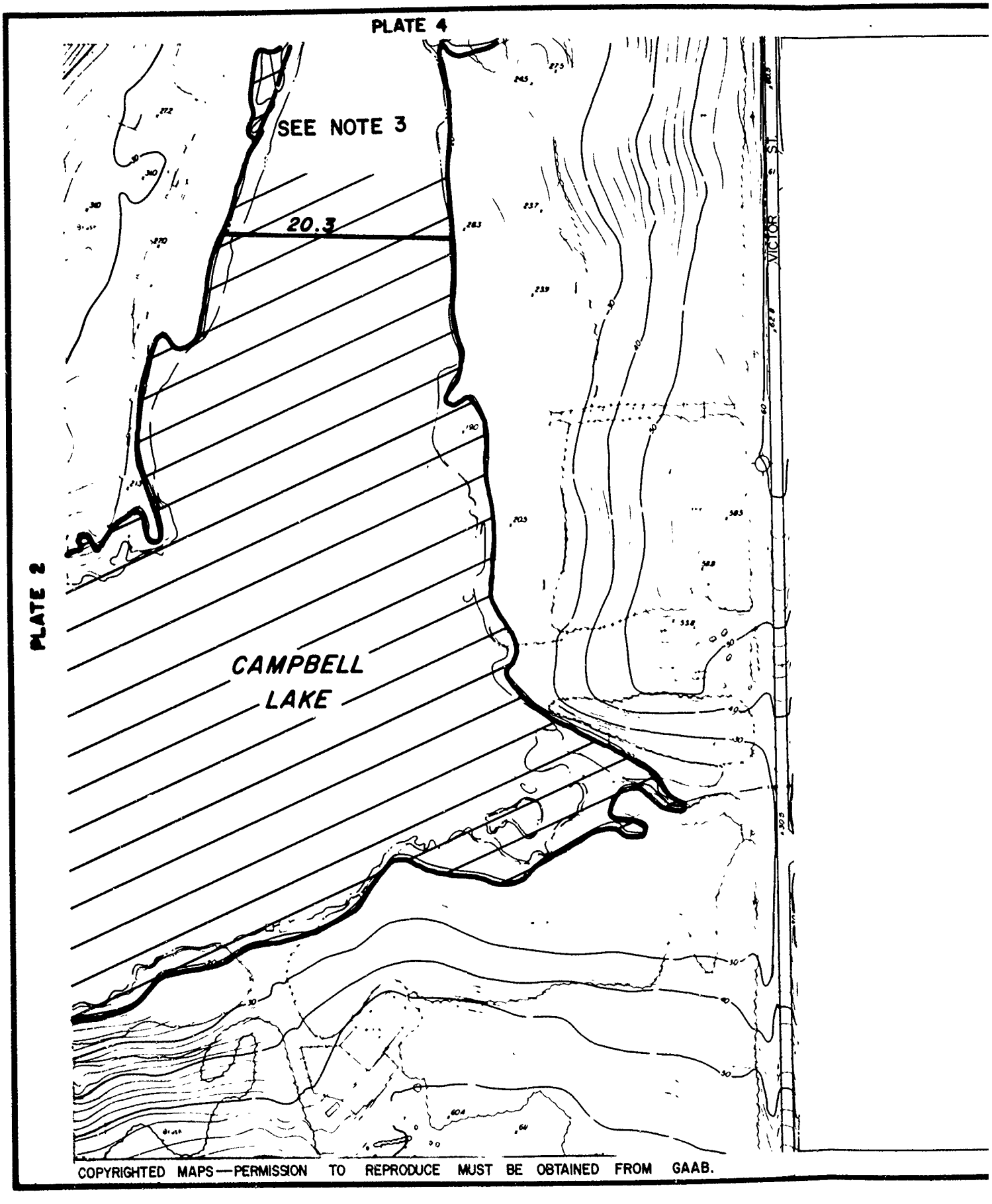
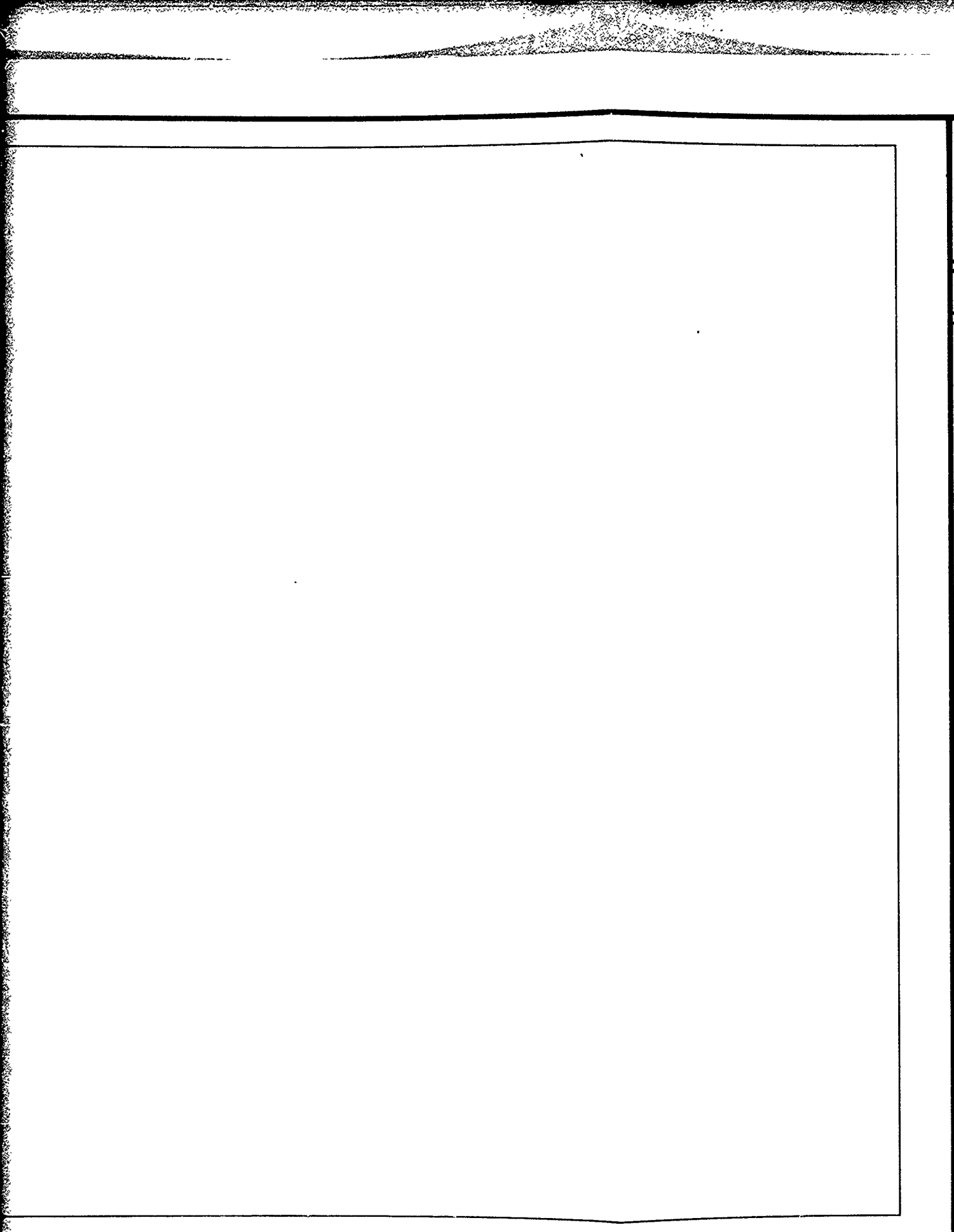
MAY 1975





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3. FLOODWAY BEGINS AT UPPER END OF CAMPBELL LAKE

0' 200' 400'

SCALE IN FEET

FLOODED AREA MAP
SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE 3

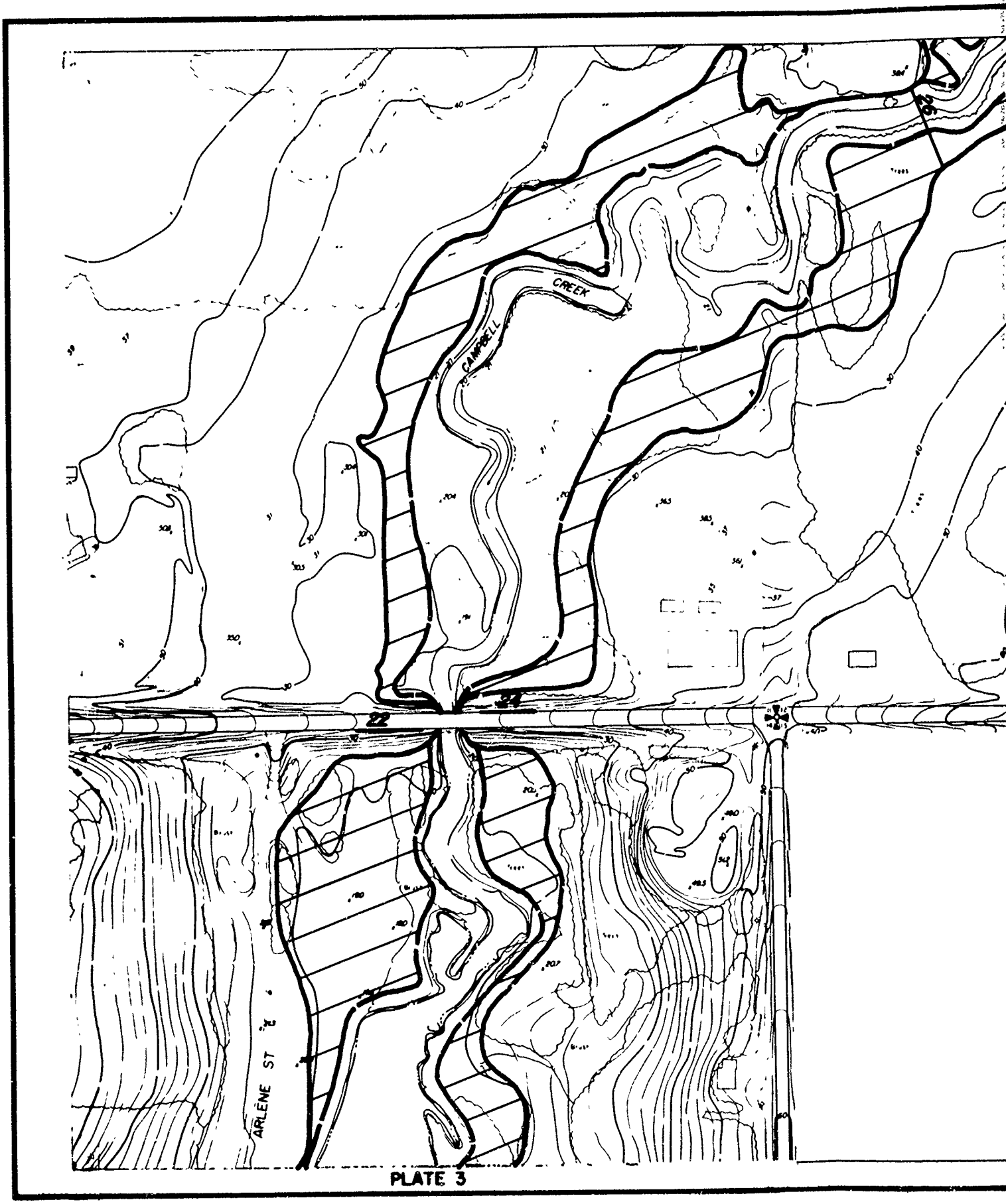
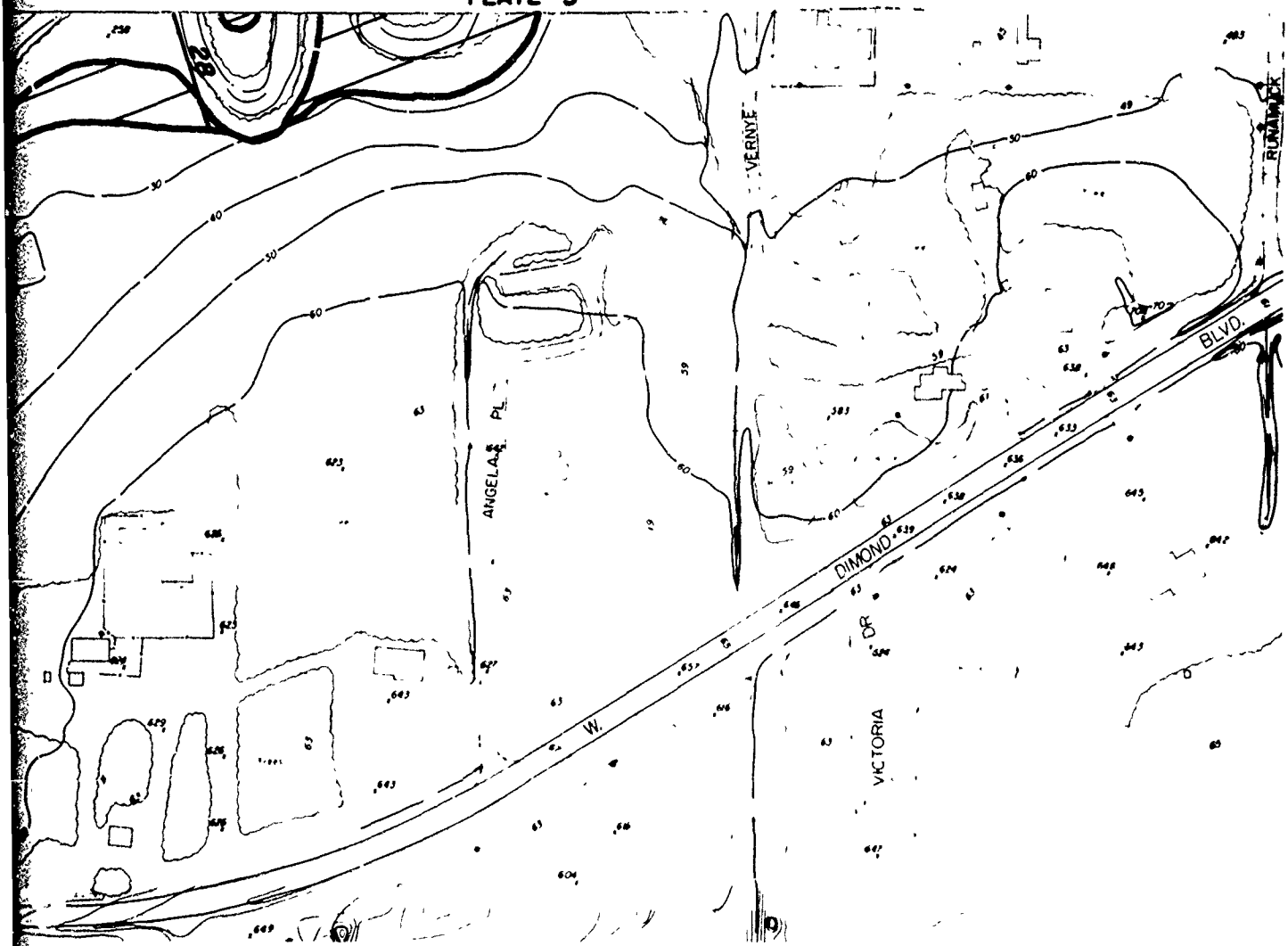


PLATE 3

PLATE 5



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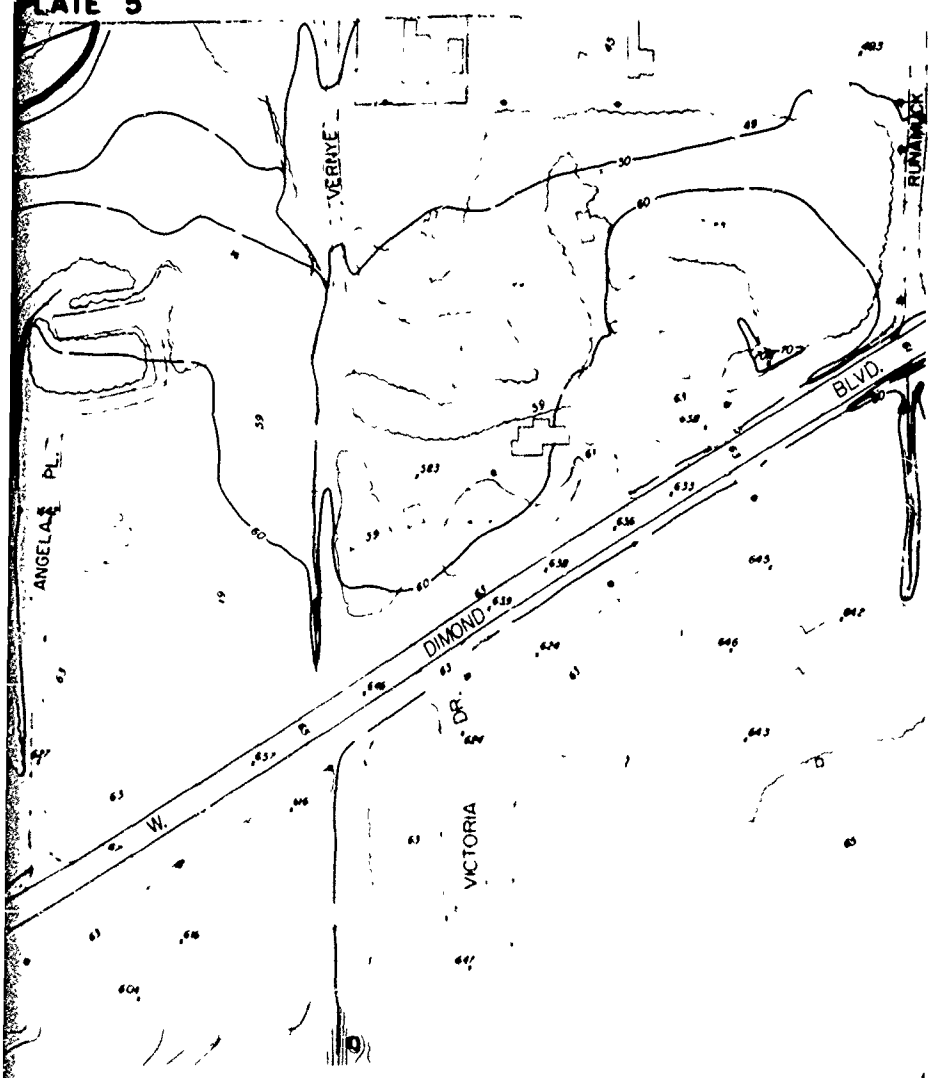

LEGEND

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SCALE IN FEET

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CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

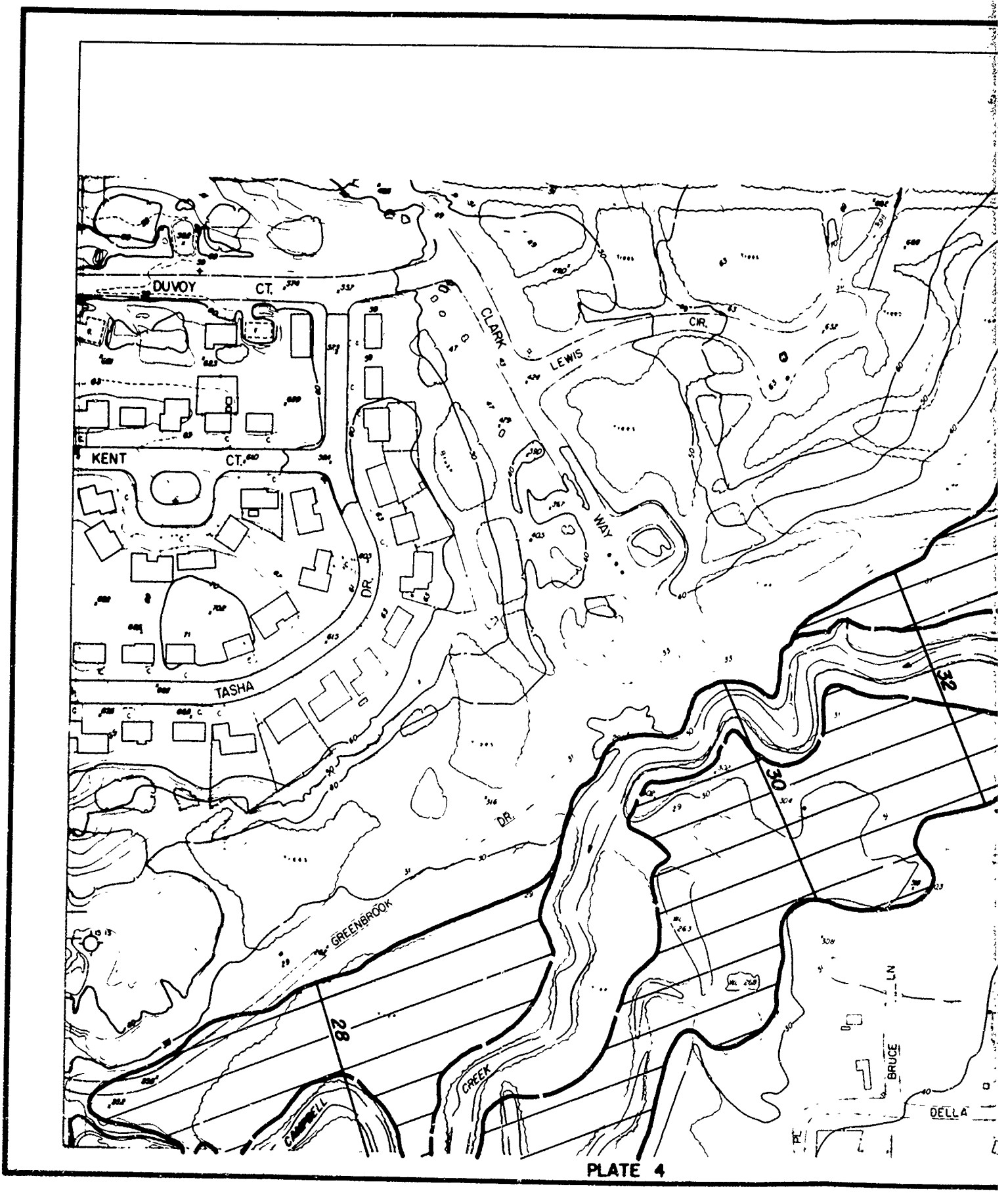
DUVOY CT.
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PLATE 4

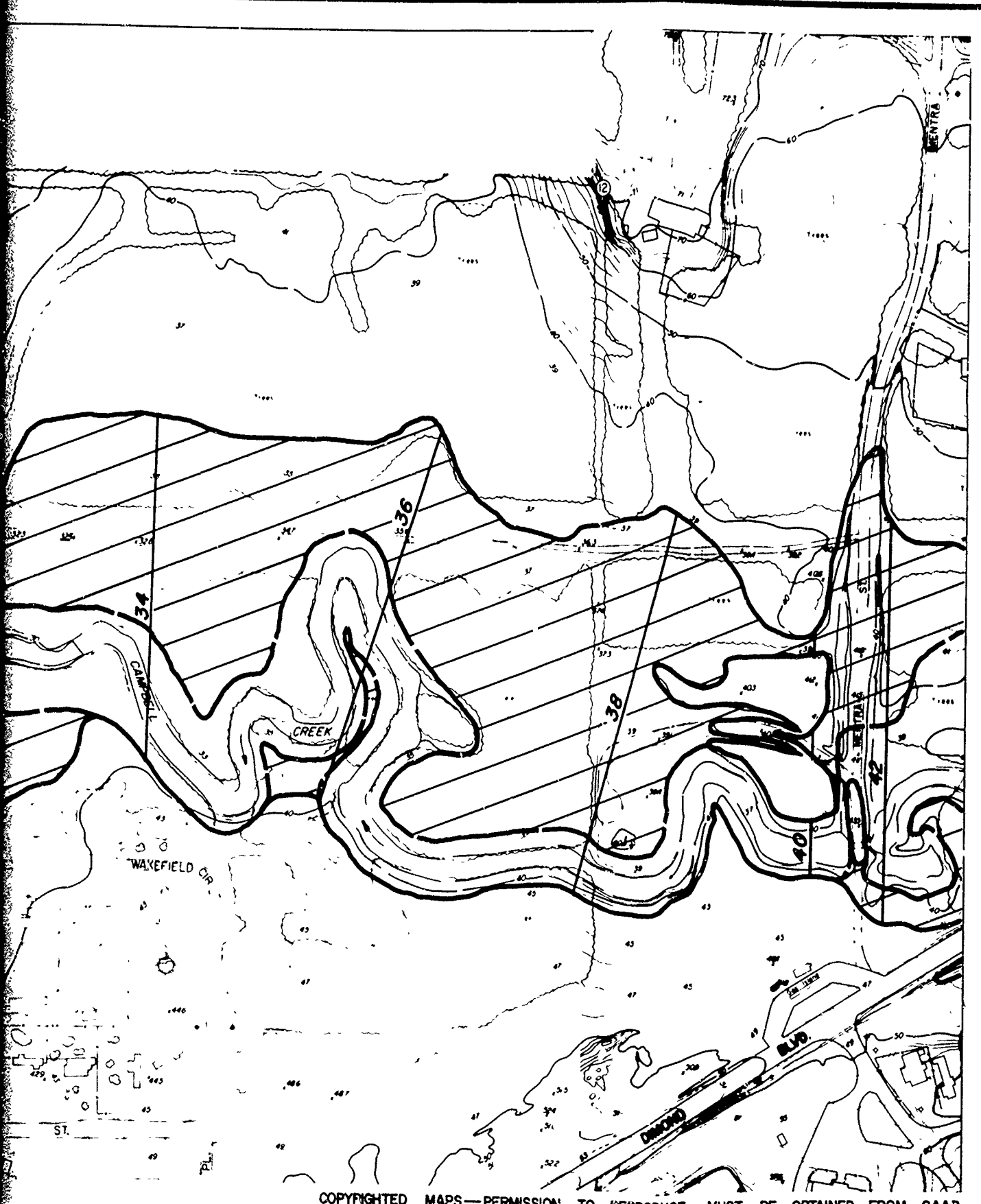

PLATE 6

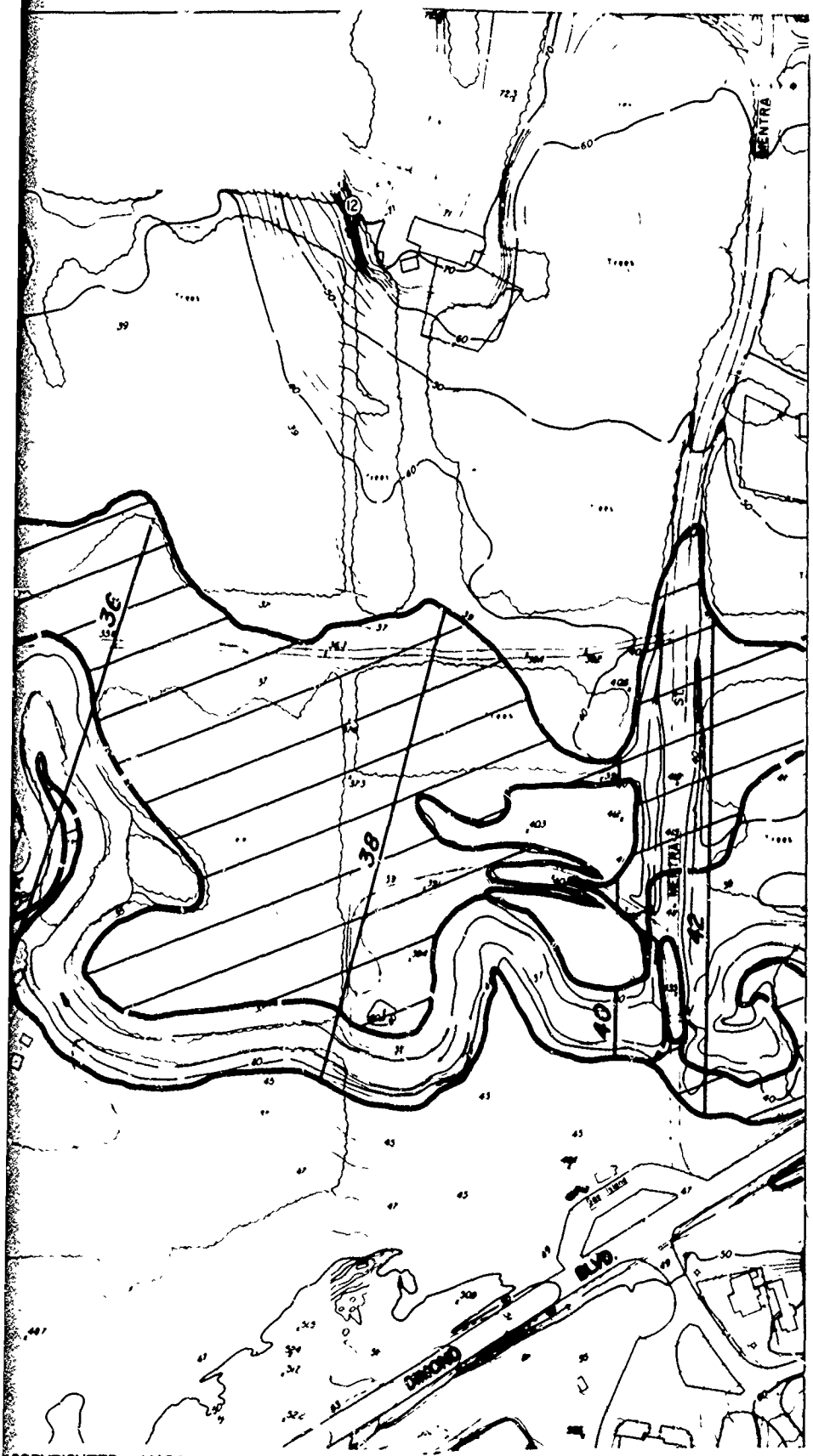

PLATE 6

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS — INTERMEDIATE REGIONAL FLOOD (IRF)

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SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE 5

PLATE 5

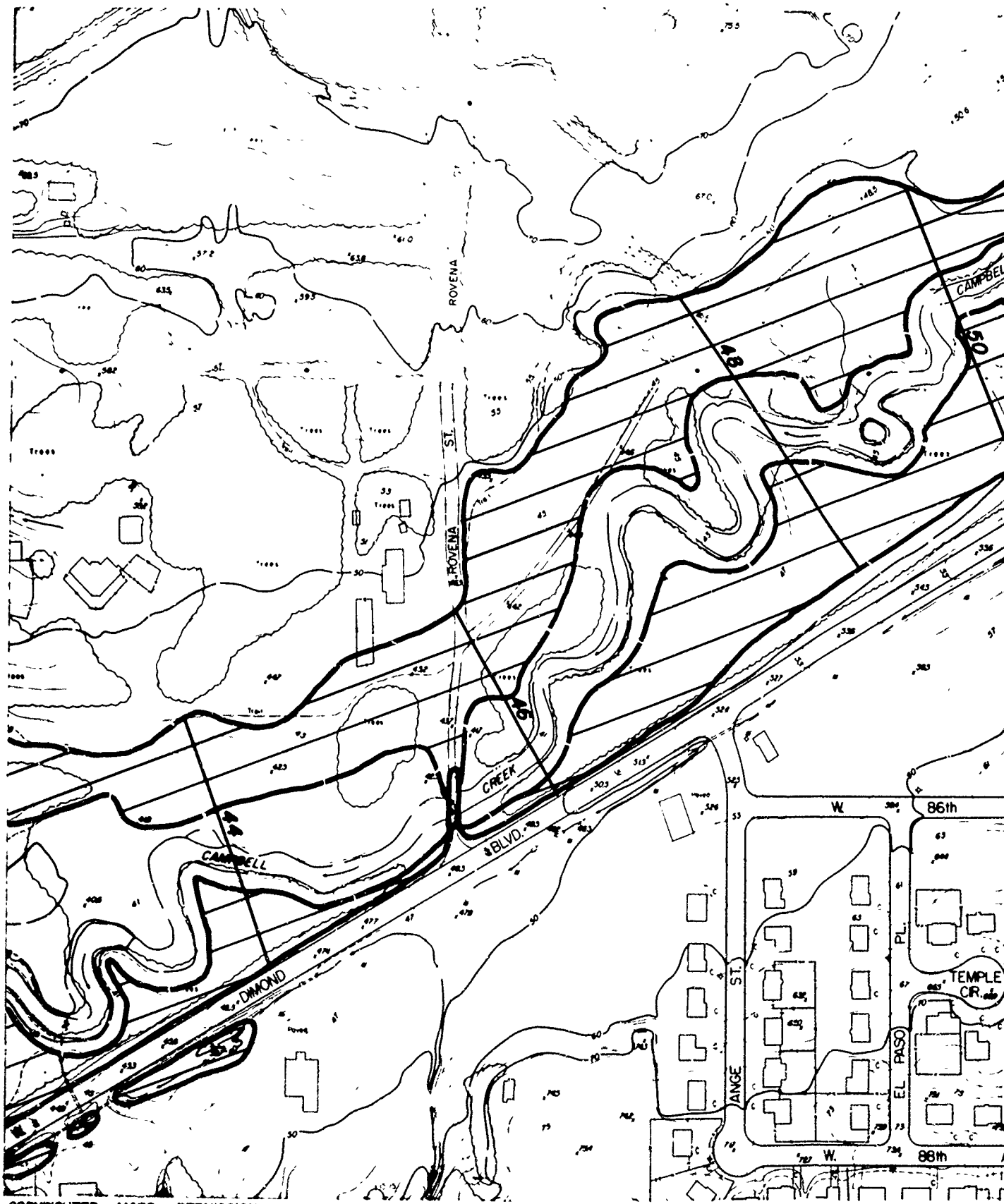
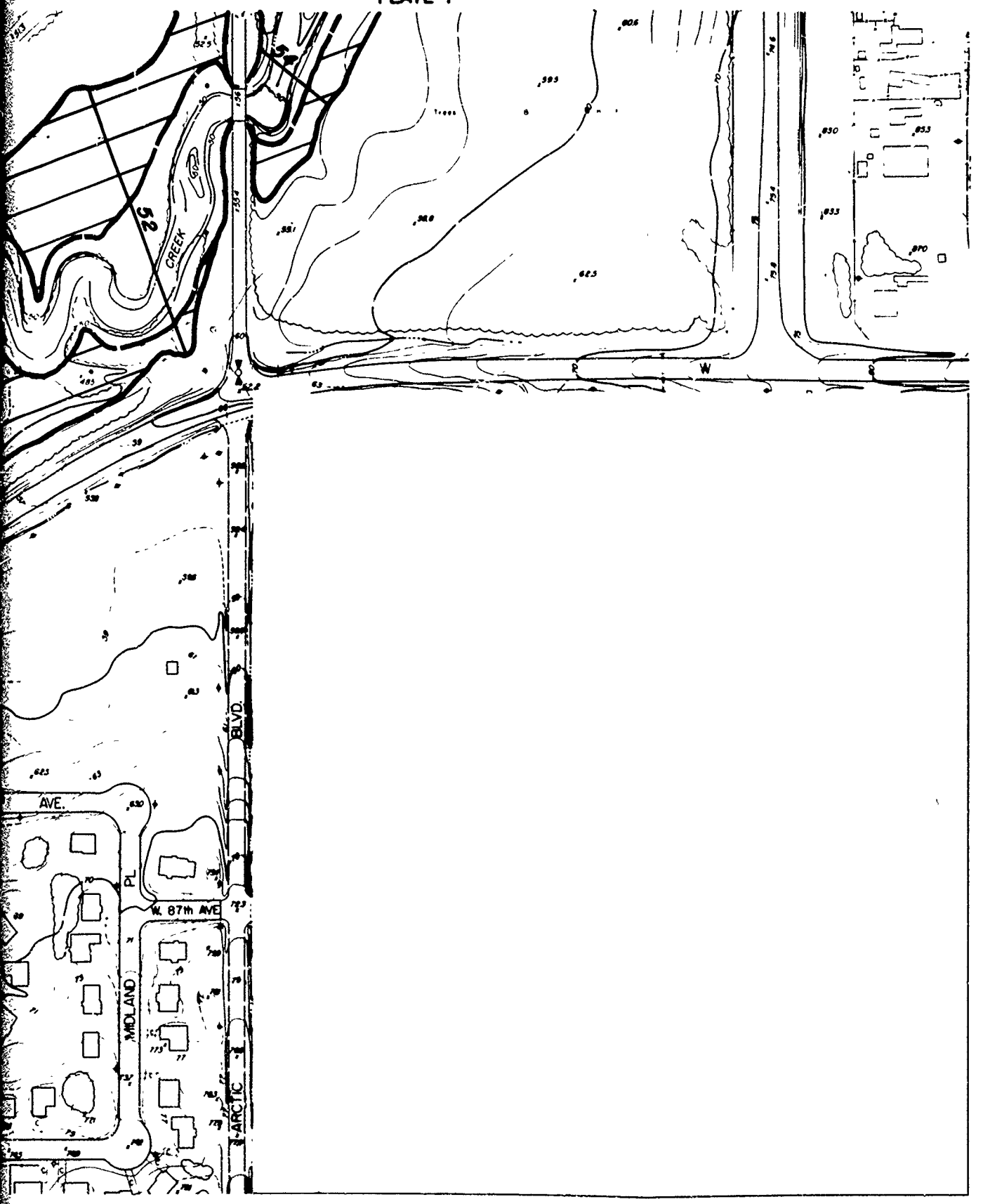


PLATE 7



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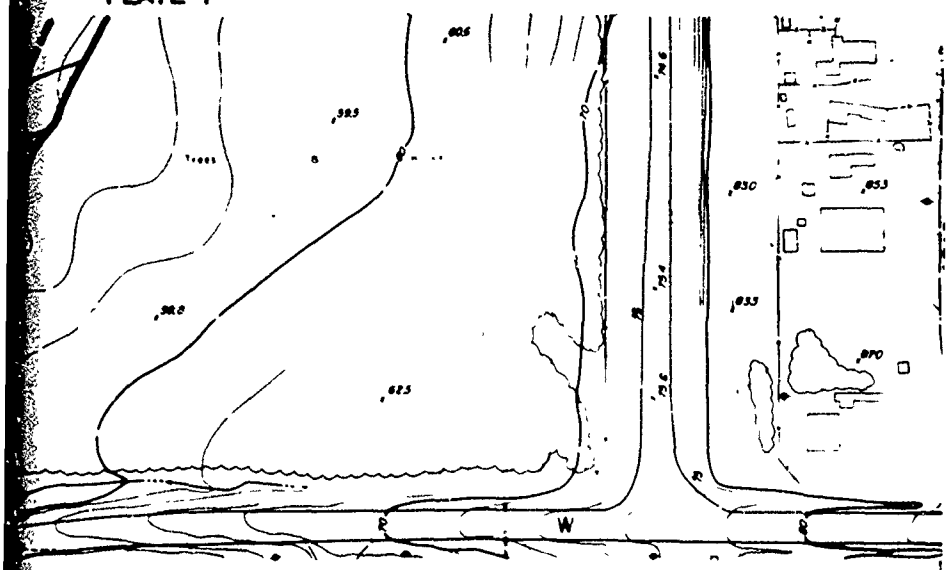

LEGEND

OVERFLOW LIMITS

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56 APPROXIMATE WATER SURFACE ELEVATION DURING IRF

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0' 200' 400'

SCALE IN FEET

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CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE 6


BRADLEY
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PLATE 6

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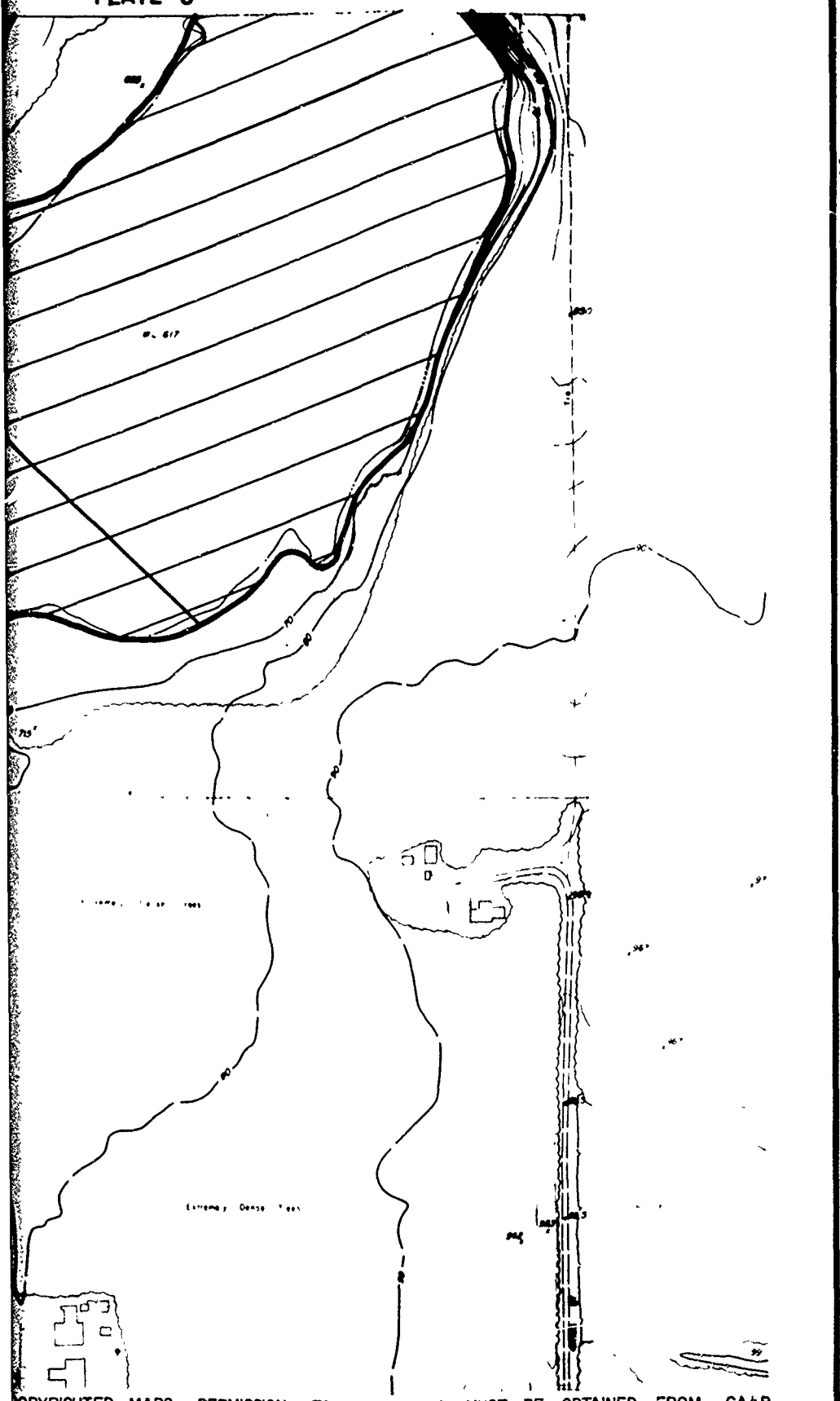

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS } INTERMEDIATE REGIONAL FLOOD (IRF)

56 — APPROXIMATE WATER SURFACE ELEVATION DURING IRF

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SCALE IN FEET

FLOODED AREA MAP
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CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE 7

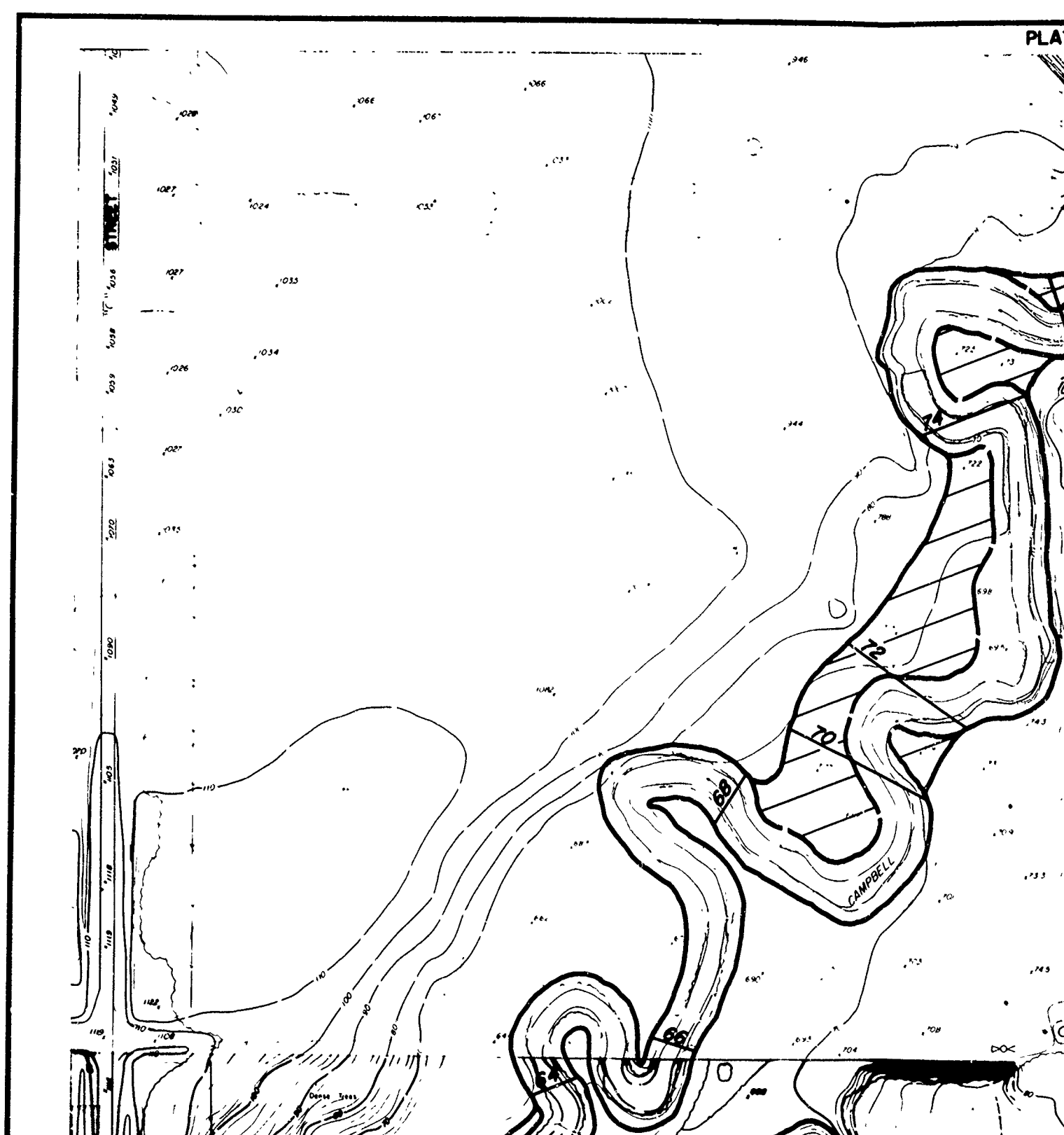

PLATE 7

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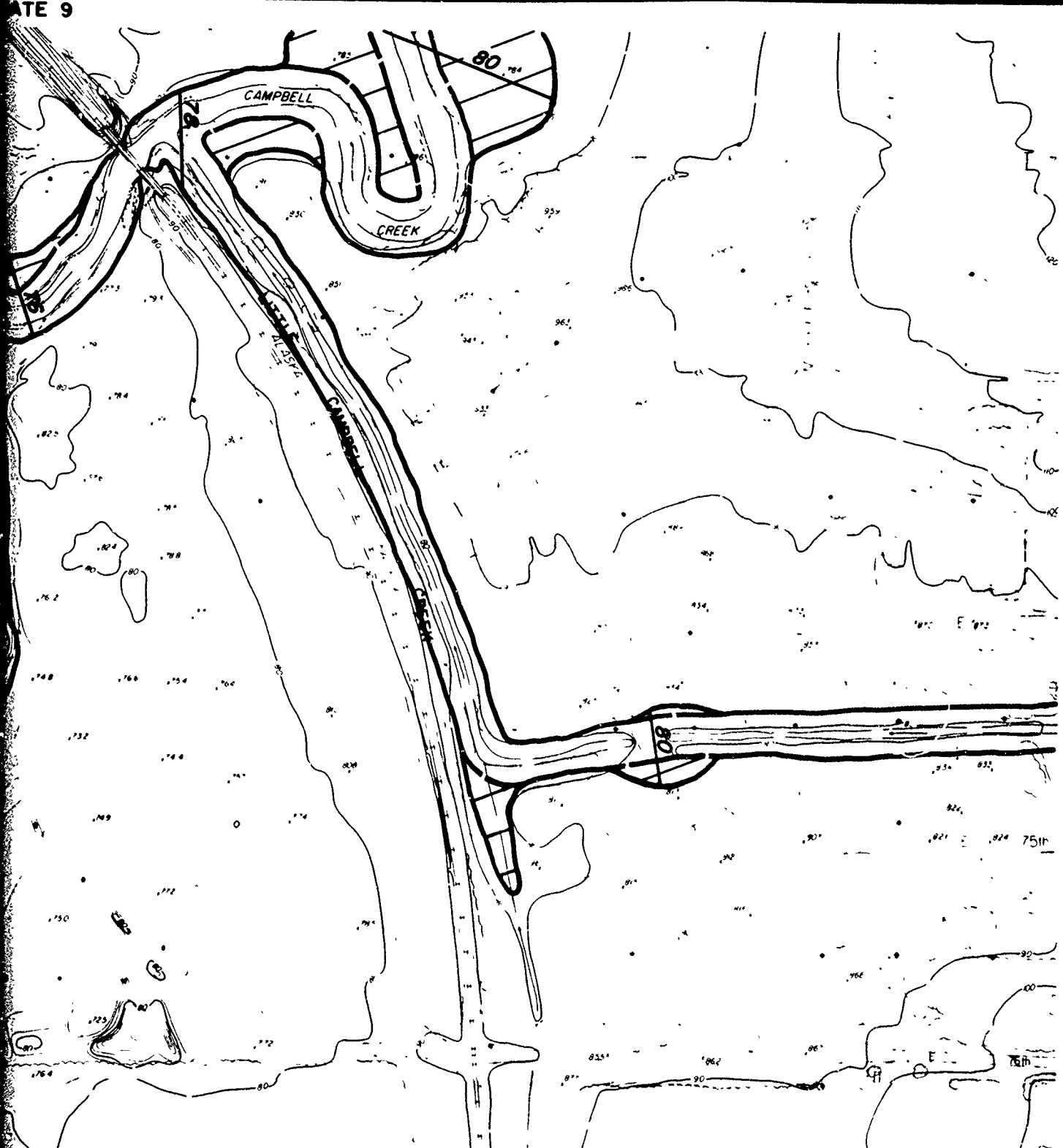

PLATE 18

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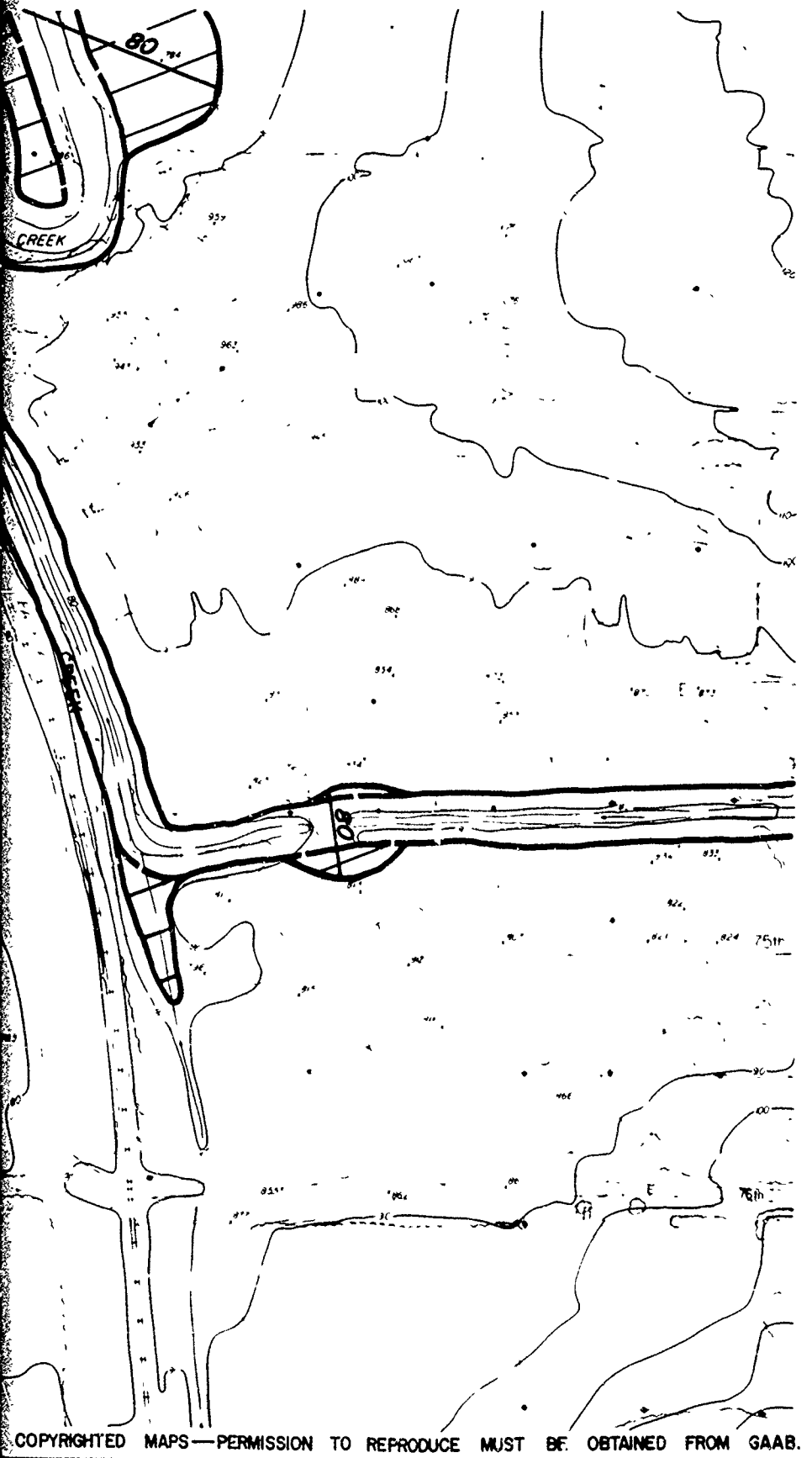

LEGEND

OVERFLOW LIMITS

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—250— GROUND ELEVATION G A A B POST QUAKE DATUM (MSL 1972)

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CAMPBELL CREEK
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ANCHORAGE, ALASKA

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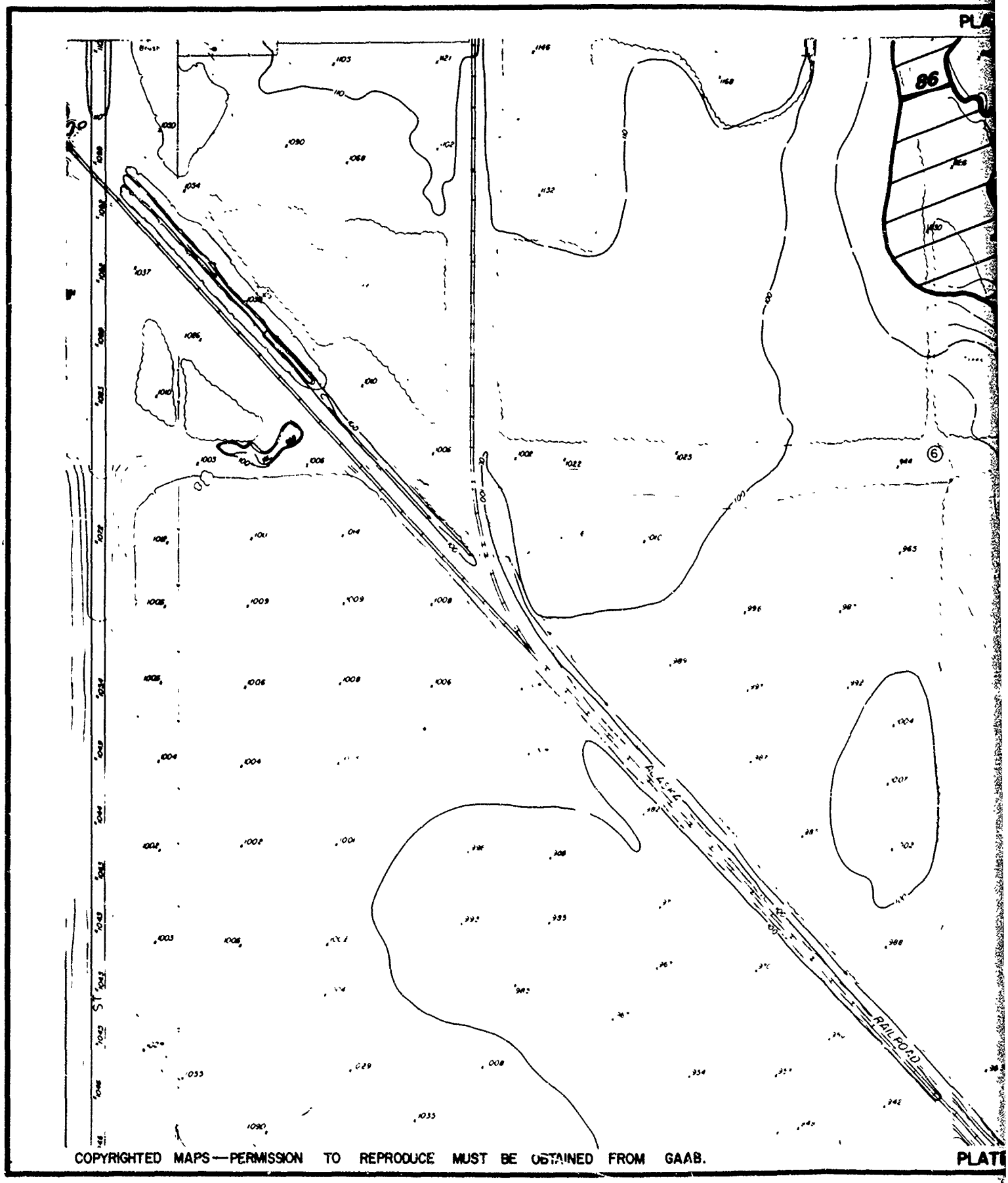

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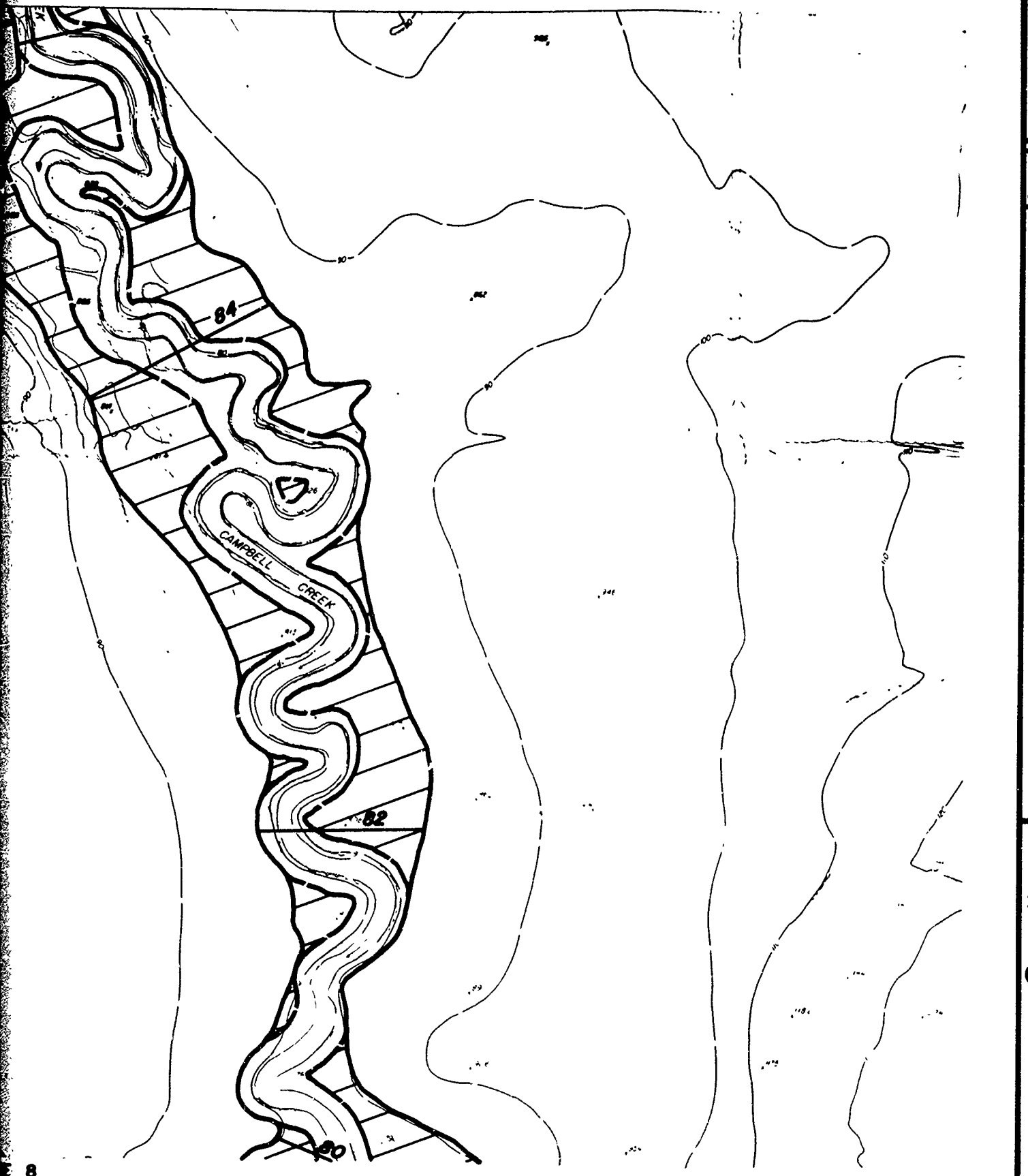

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ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE II

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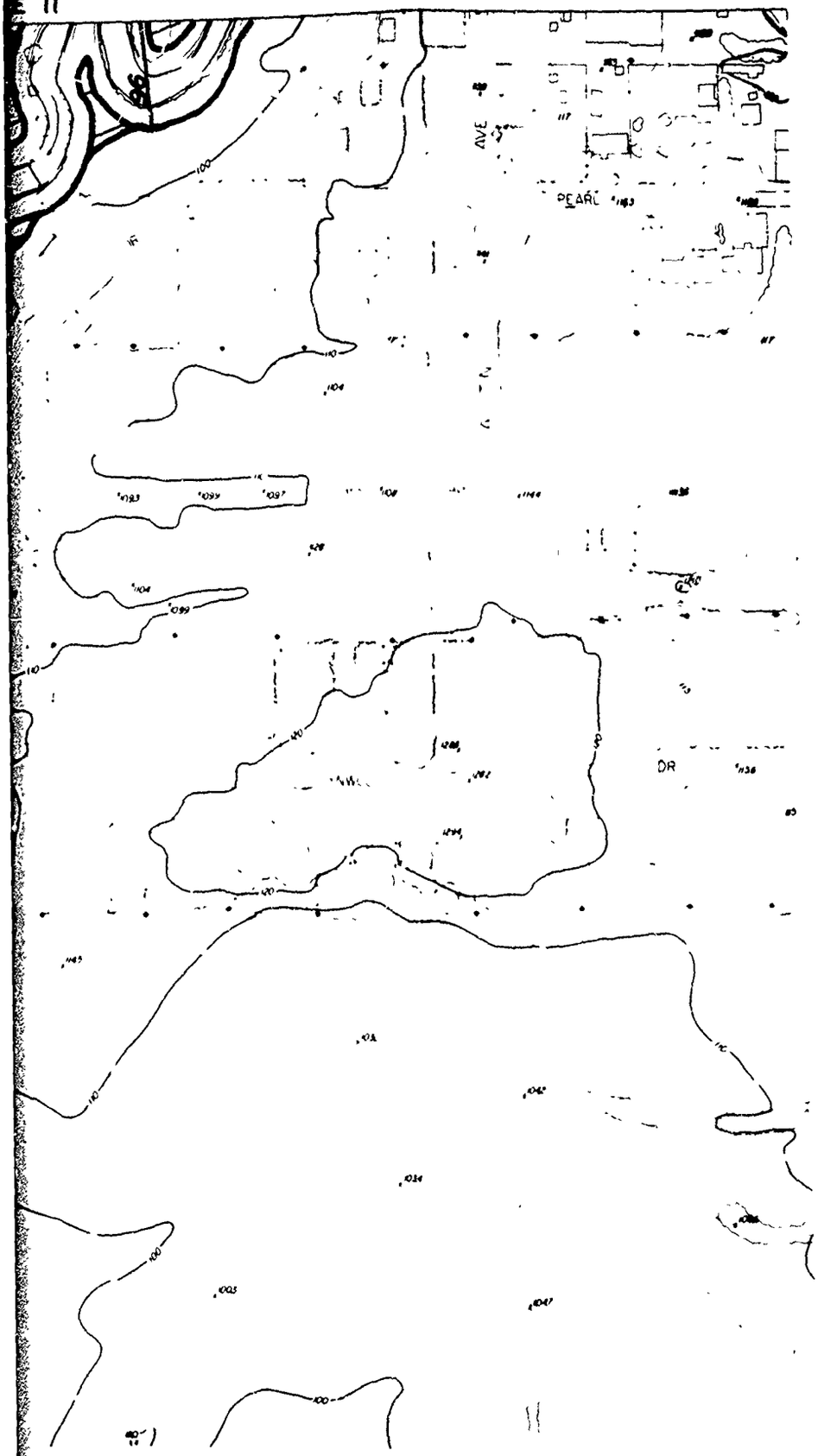

LEGEND

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CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROU
ALASKA

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ANCHORAGE, ALASKA

MAY 1975

PLATE 10


56th AVE.
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PLATE 10

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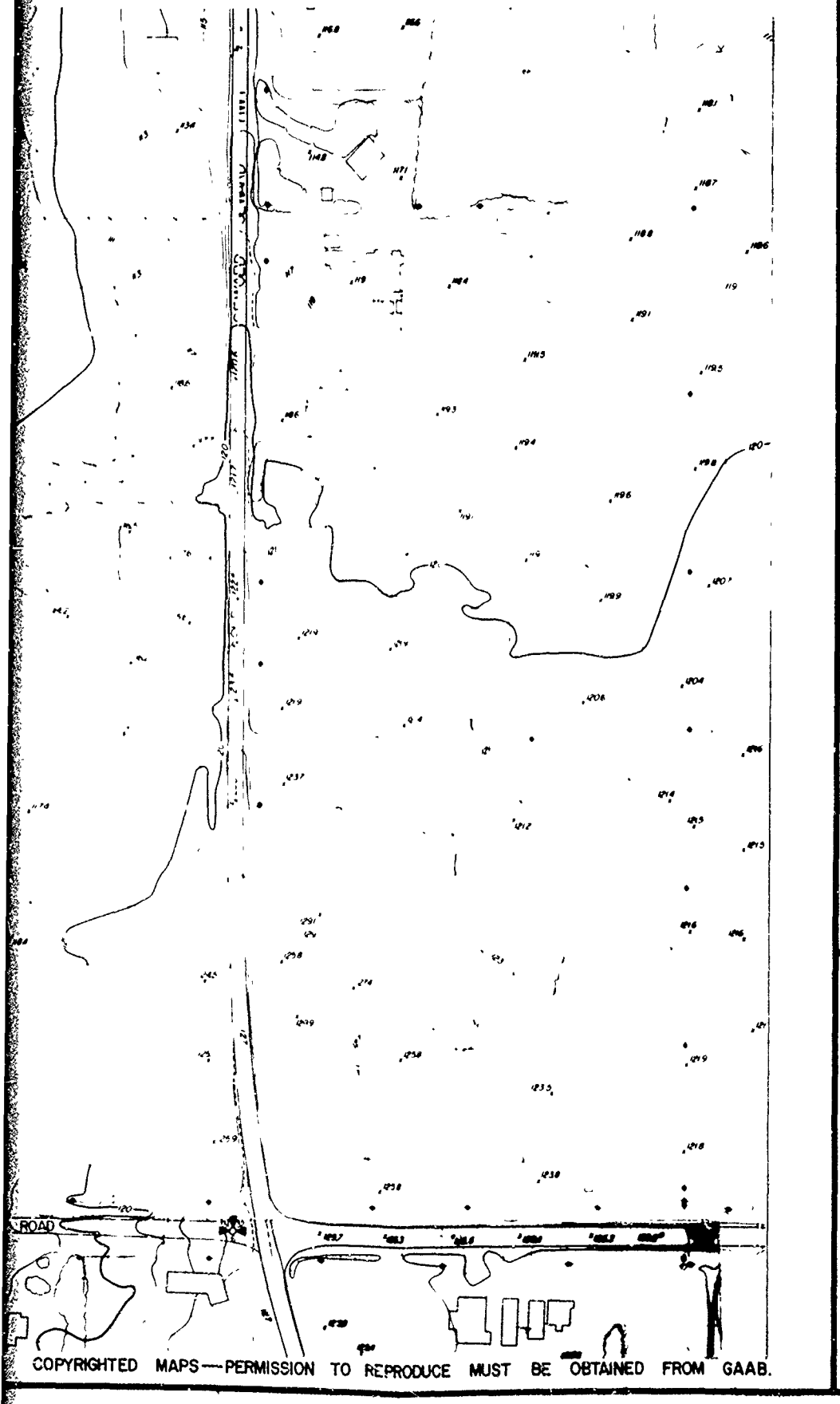

LEGEND

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0' 200' 400'

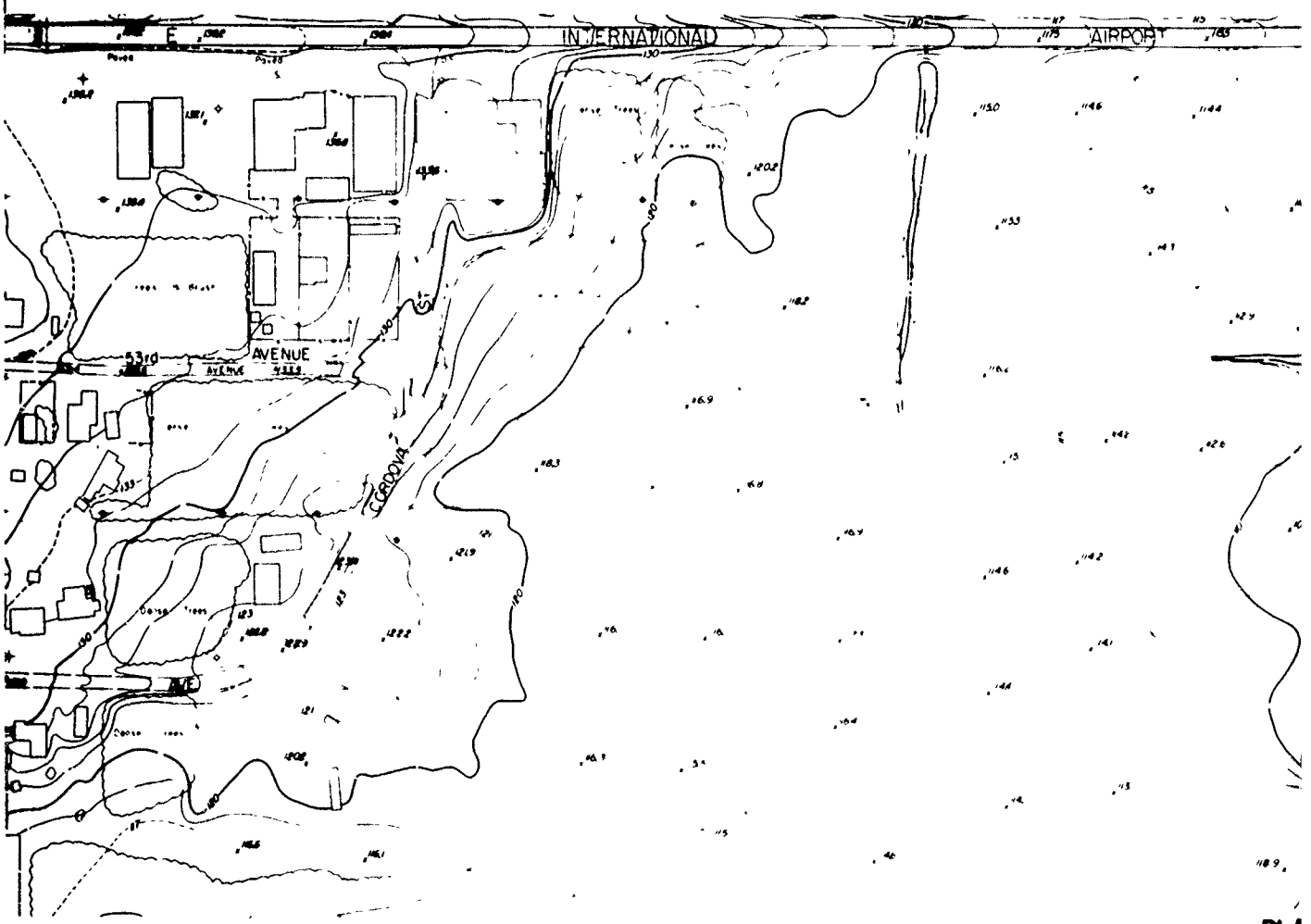
SCALE IN FEET

FLOODED AREA MAP
SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

PREPARED BY THE
DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA

MAY 1975

PLATE II



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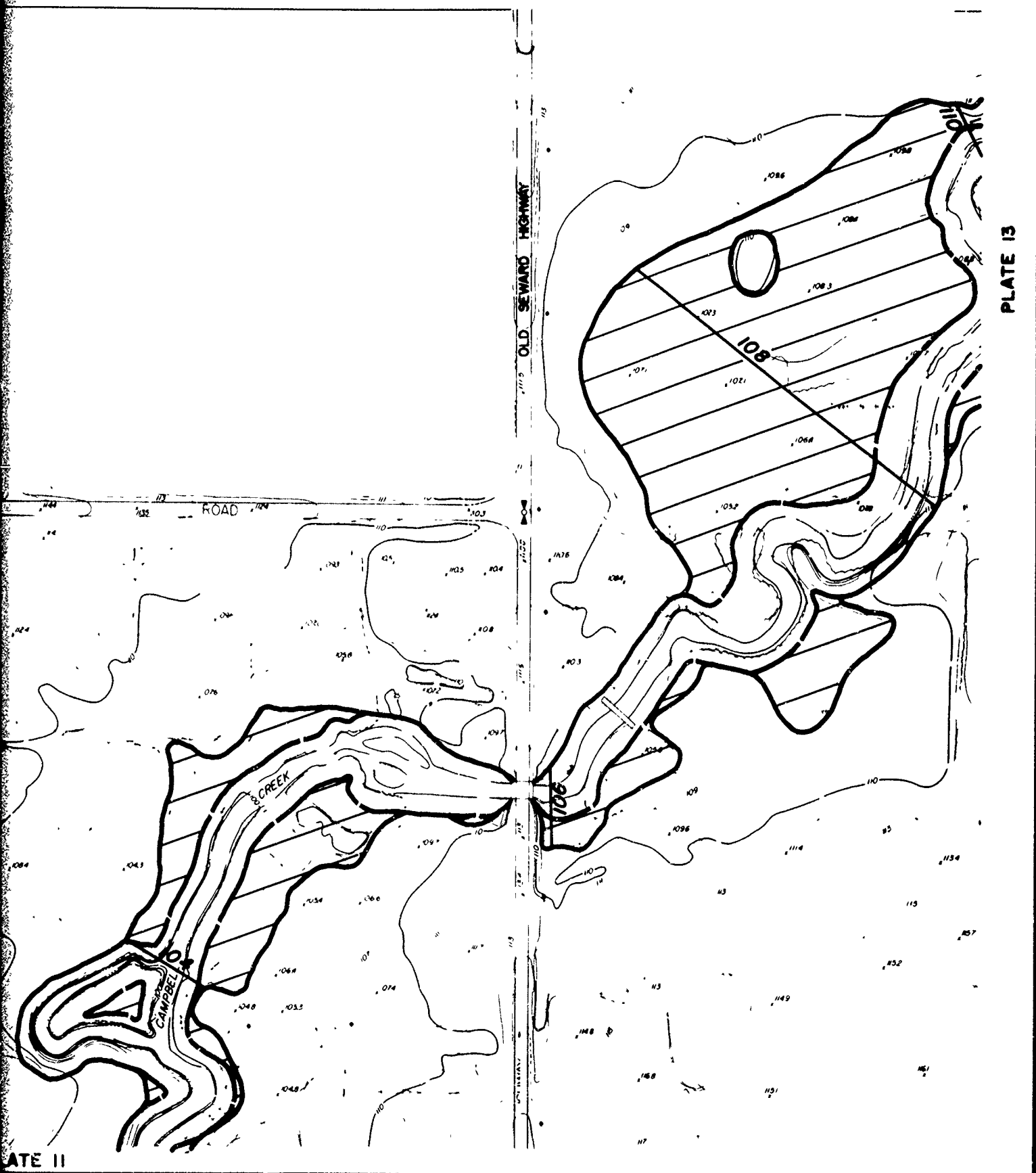

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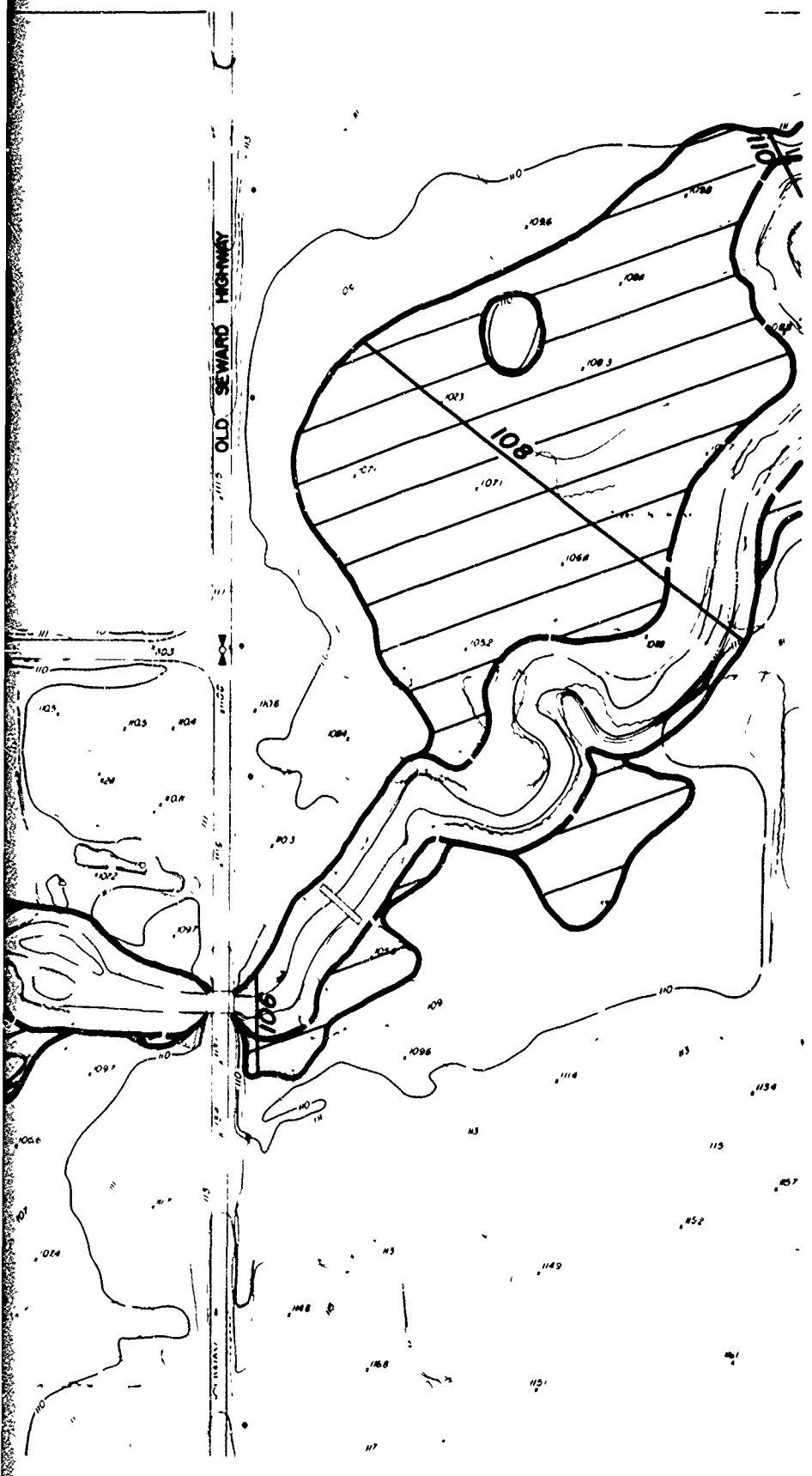

PLATE 13

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS } INTERMEDIATE REGIONAL FLOOD (IRF)

56 — APPROXIMATE WATER SURFACE ELEVATION DURING IRF

—250— GROUND ELEVATION G.A A.B. POST QUAKE DATUM (MSL 1972)

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ALASKA

PREPARED BY THE
DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA

MAY 1975

PLATE 12

PLATE 12

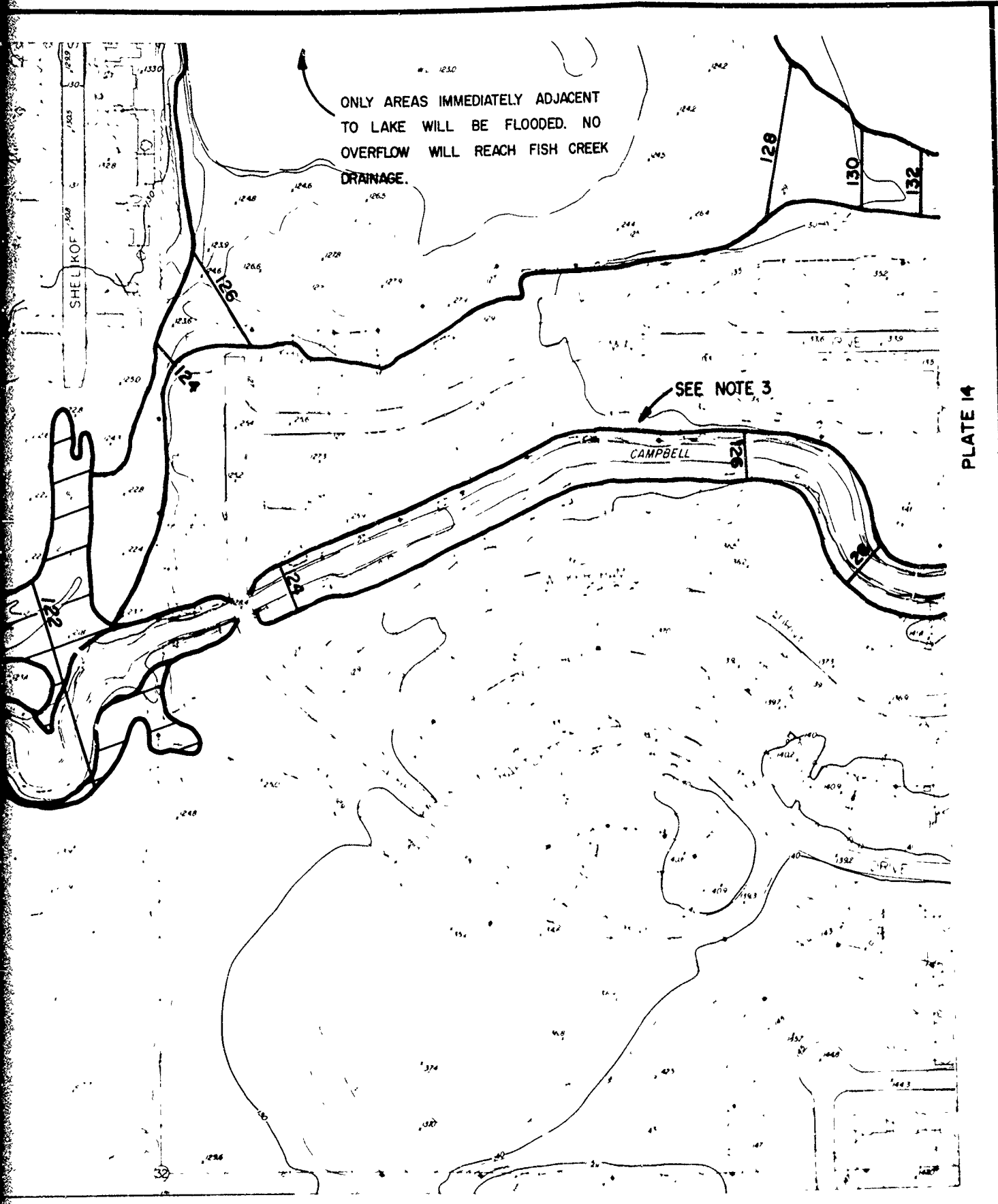

PLATE 14

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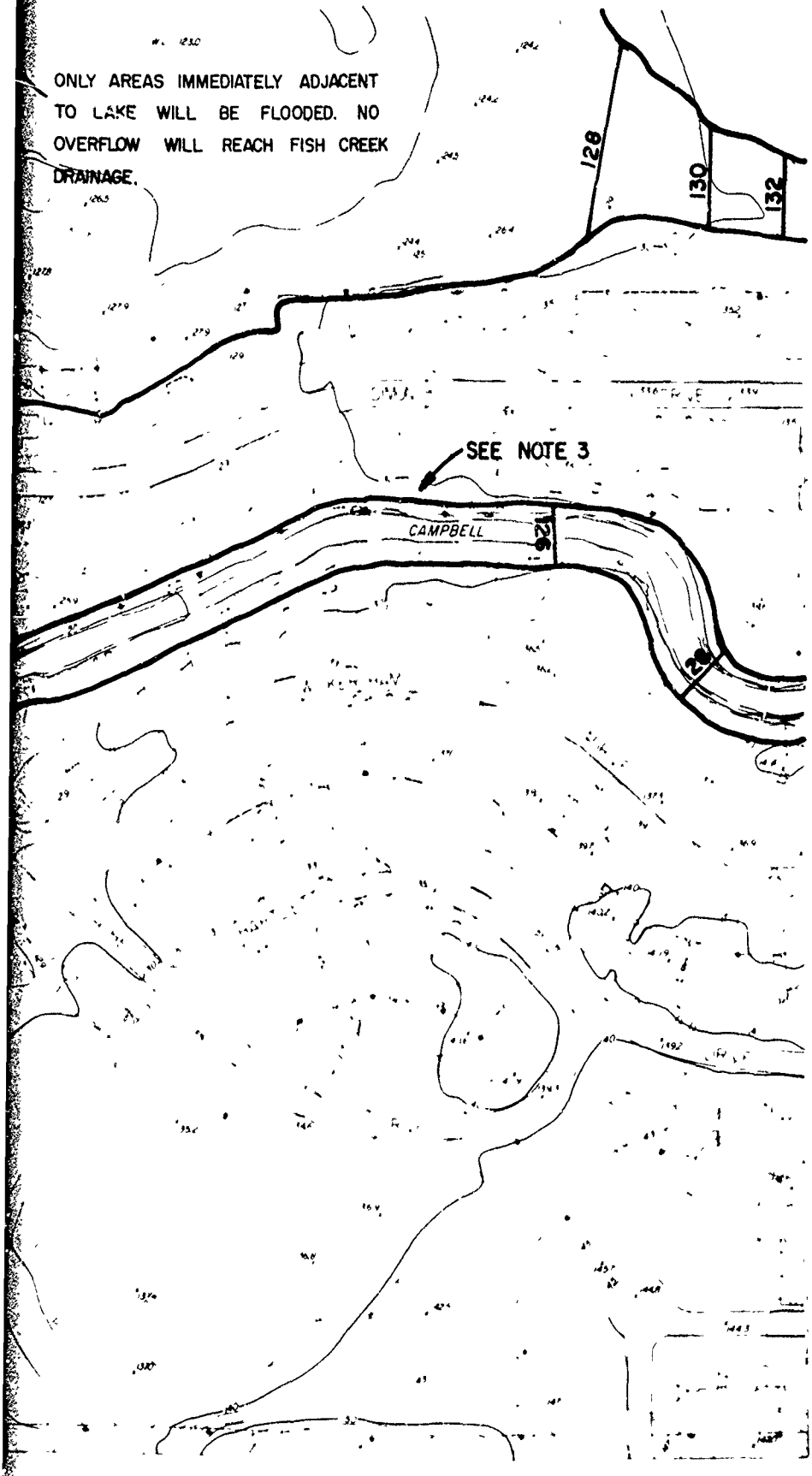

LEGEND

OVERFLOW LIMITS

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SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
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ALASKA

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ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA

MAY 1975

PLATE 13

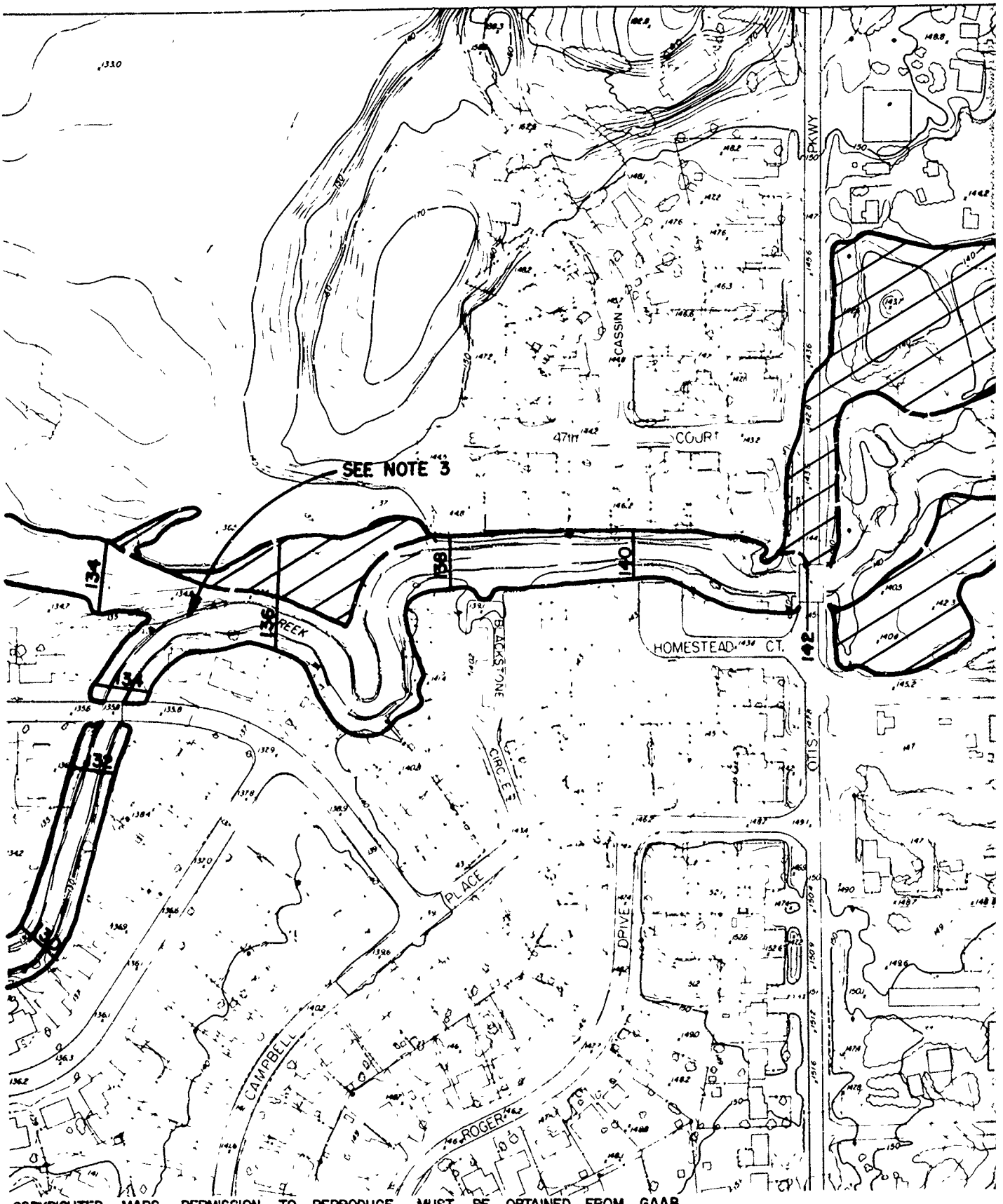

PLATE 13

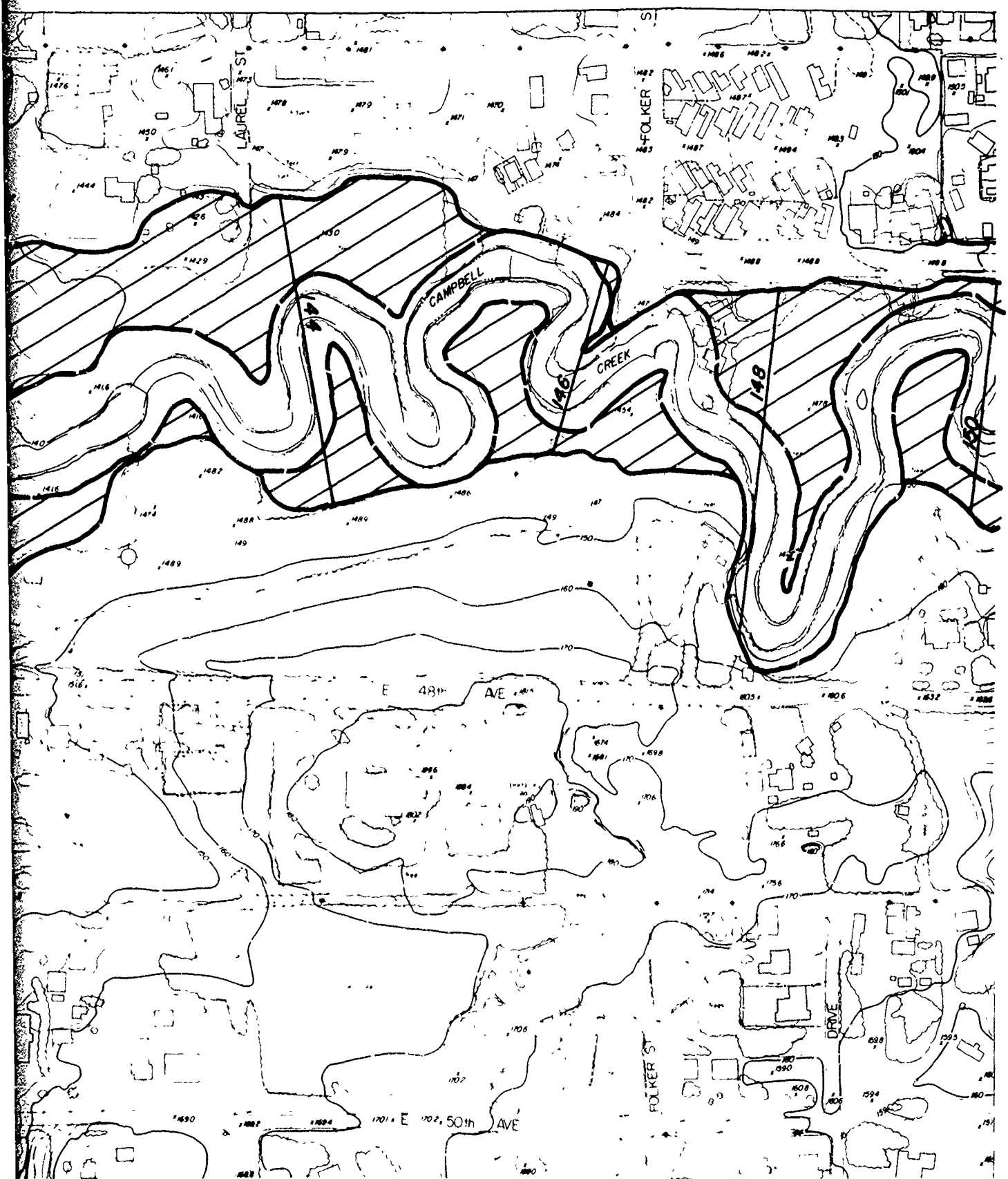

PLATE 15

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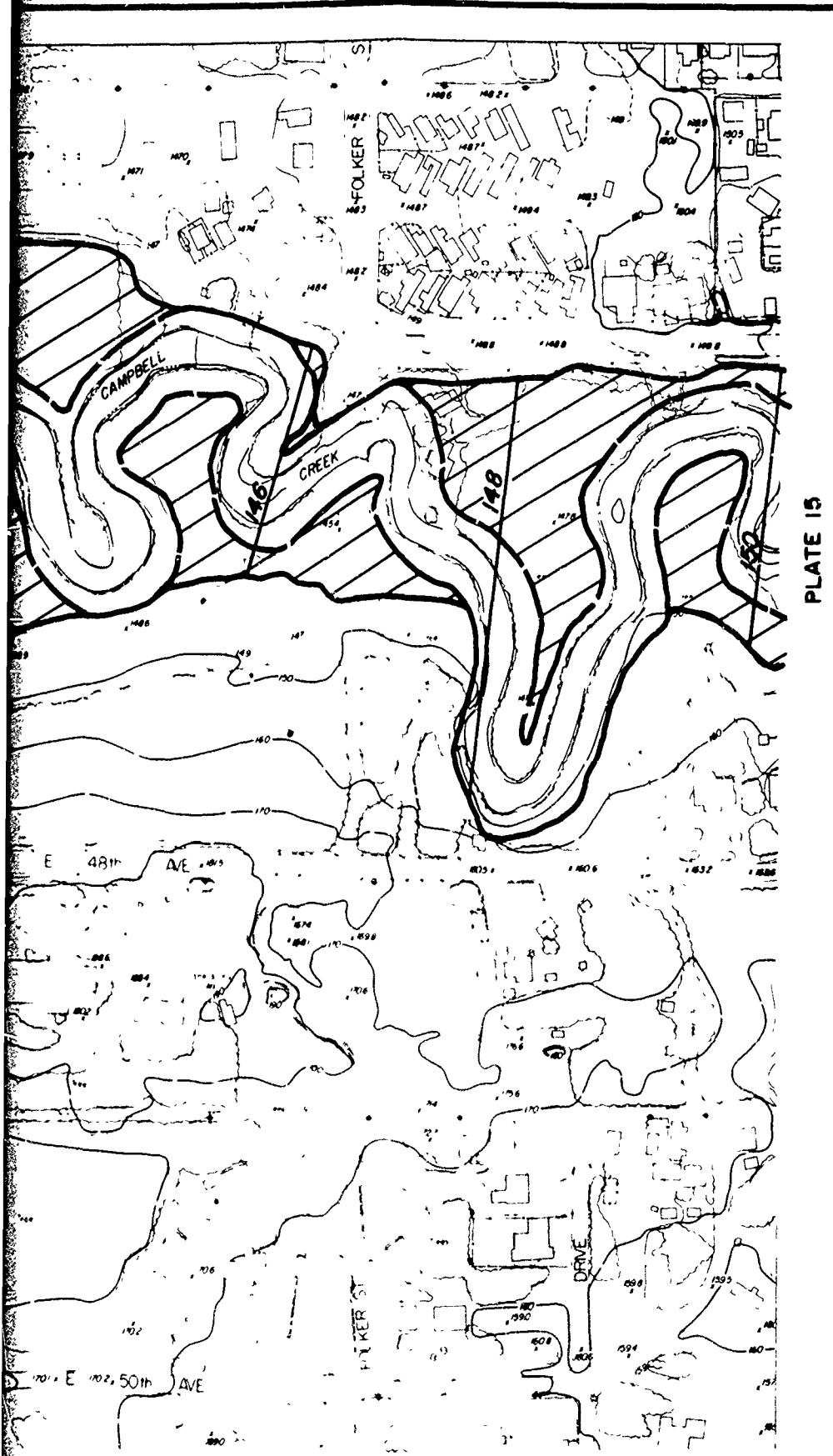

PLATE 15

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS — INTERMEDIATE REGIONAL FLOOD (IRF)

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ANCHORAGE, ALASKA

MAY 1975

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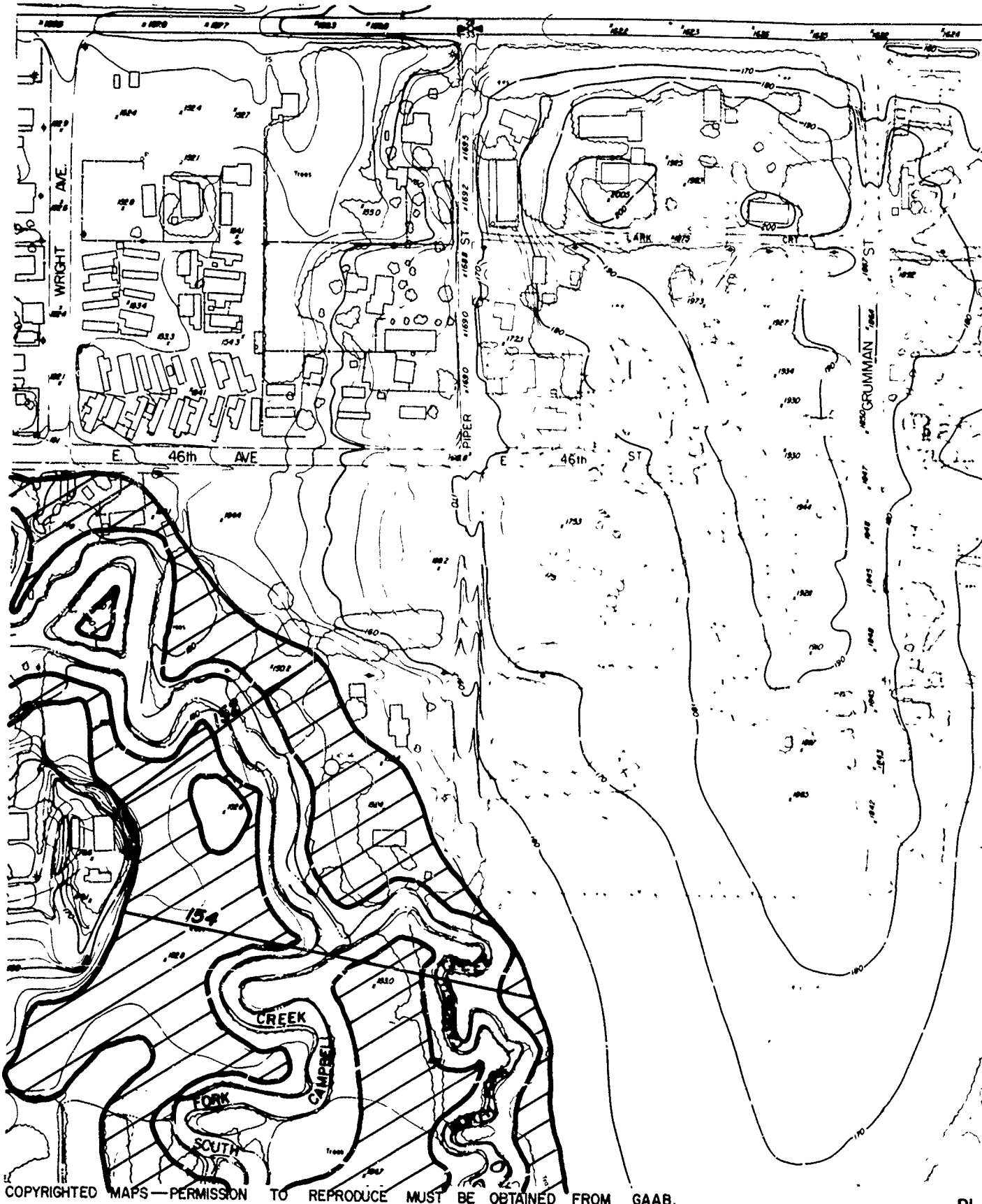

PLATE 14

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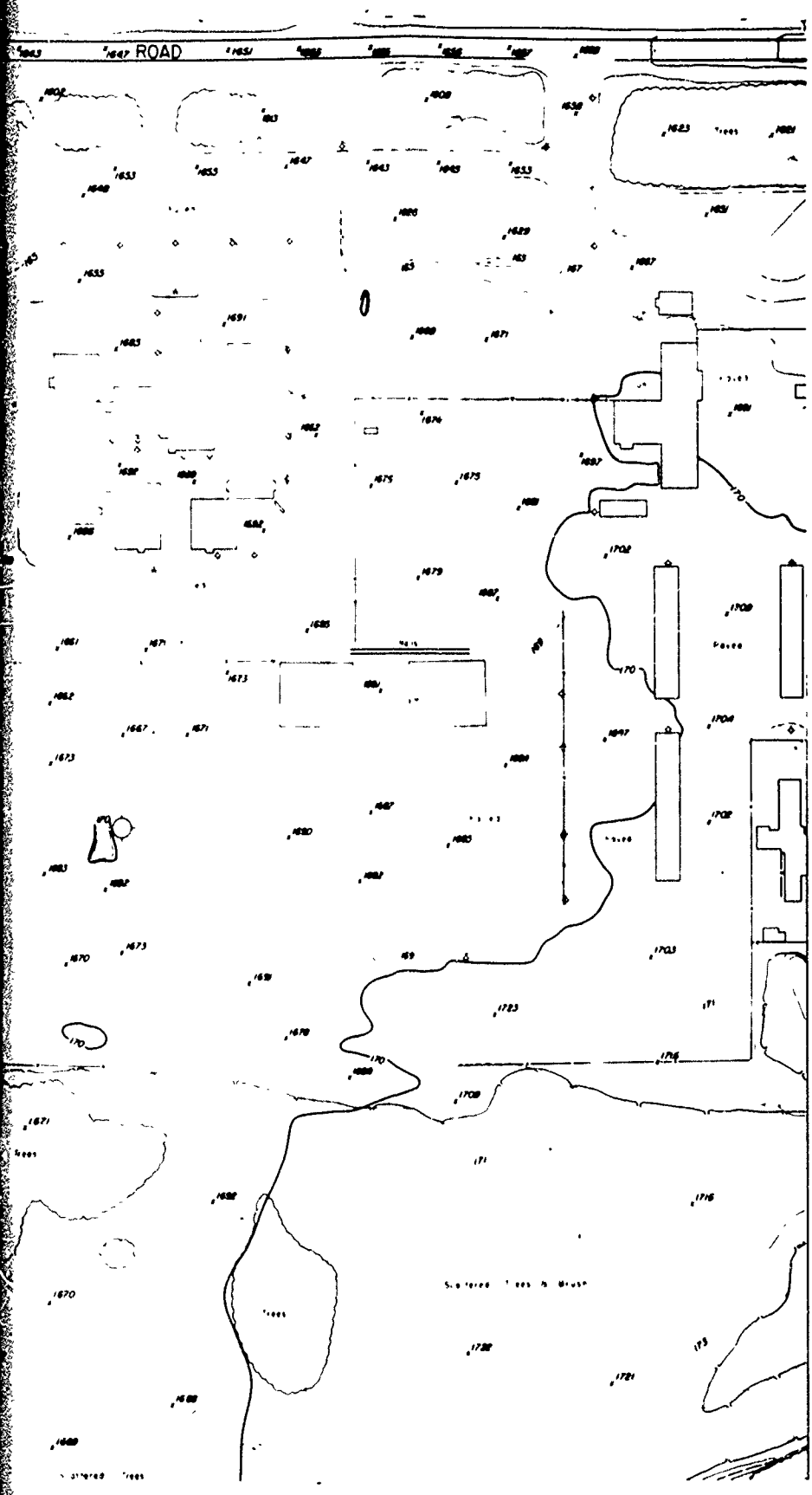

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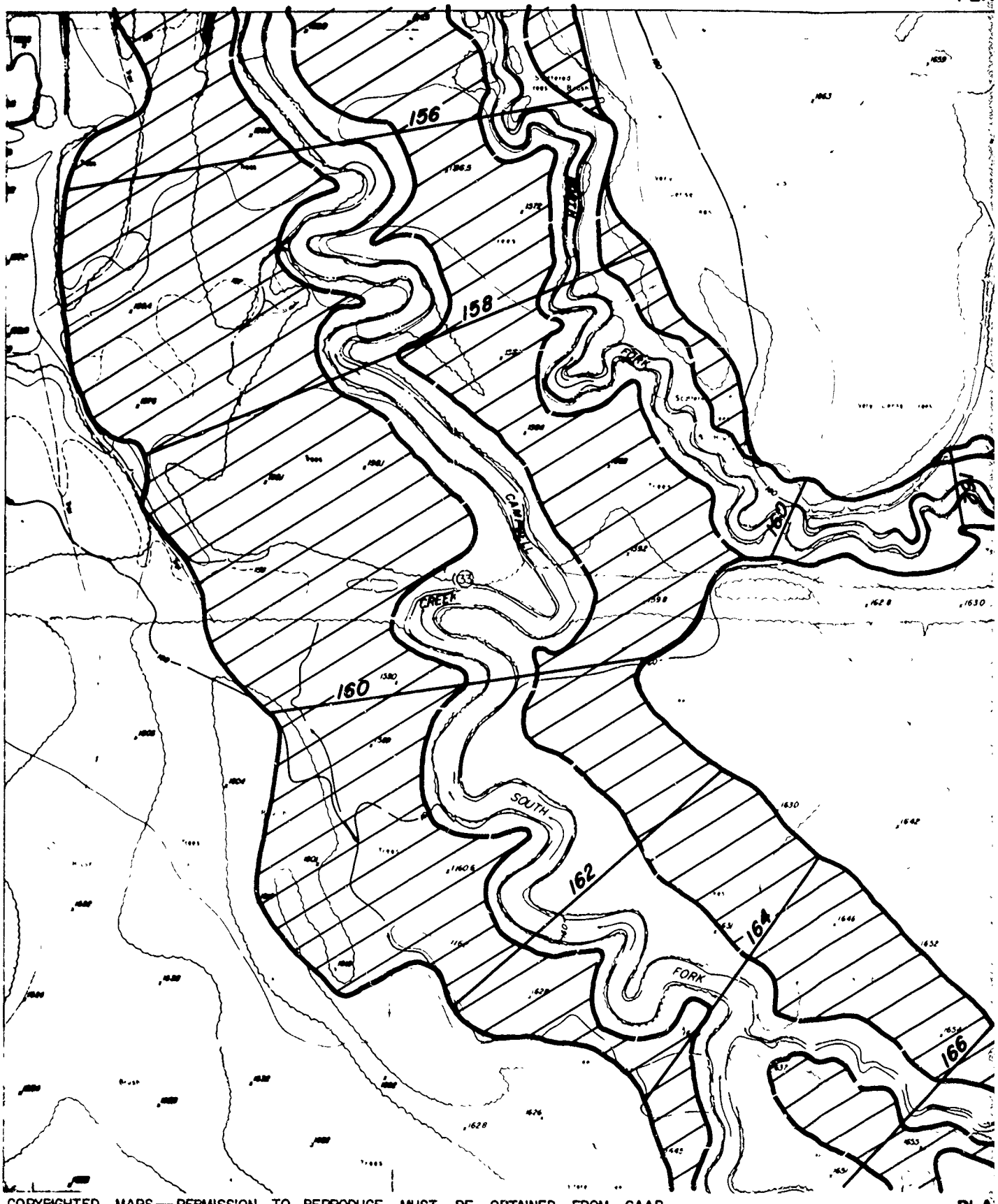
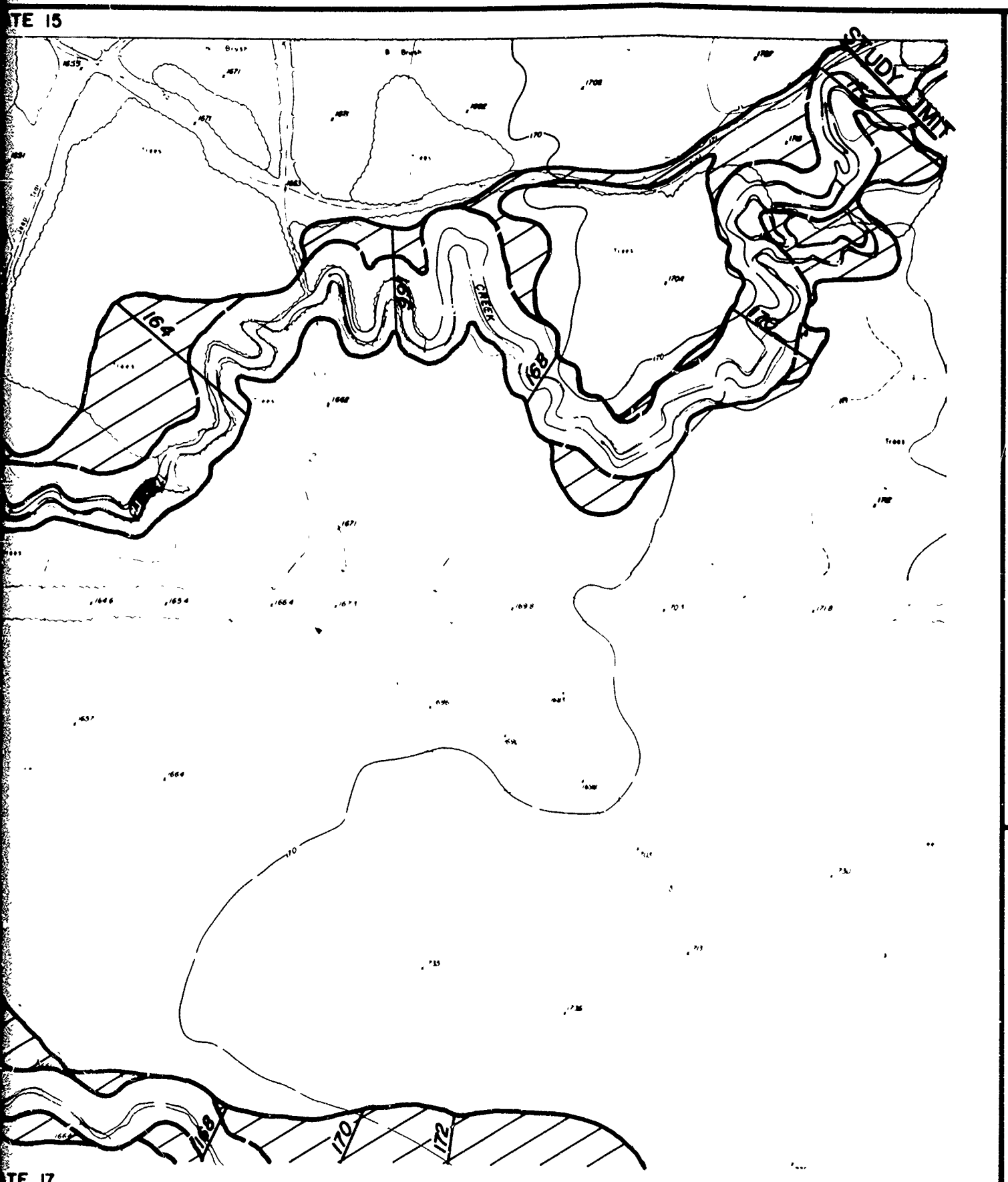
ANCHORAGE, ALASKA

MAY 1975

PLATE 15





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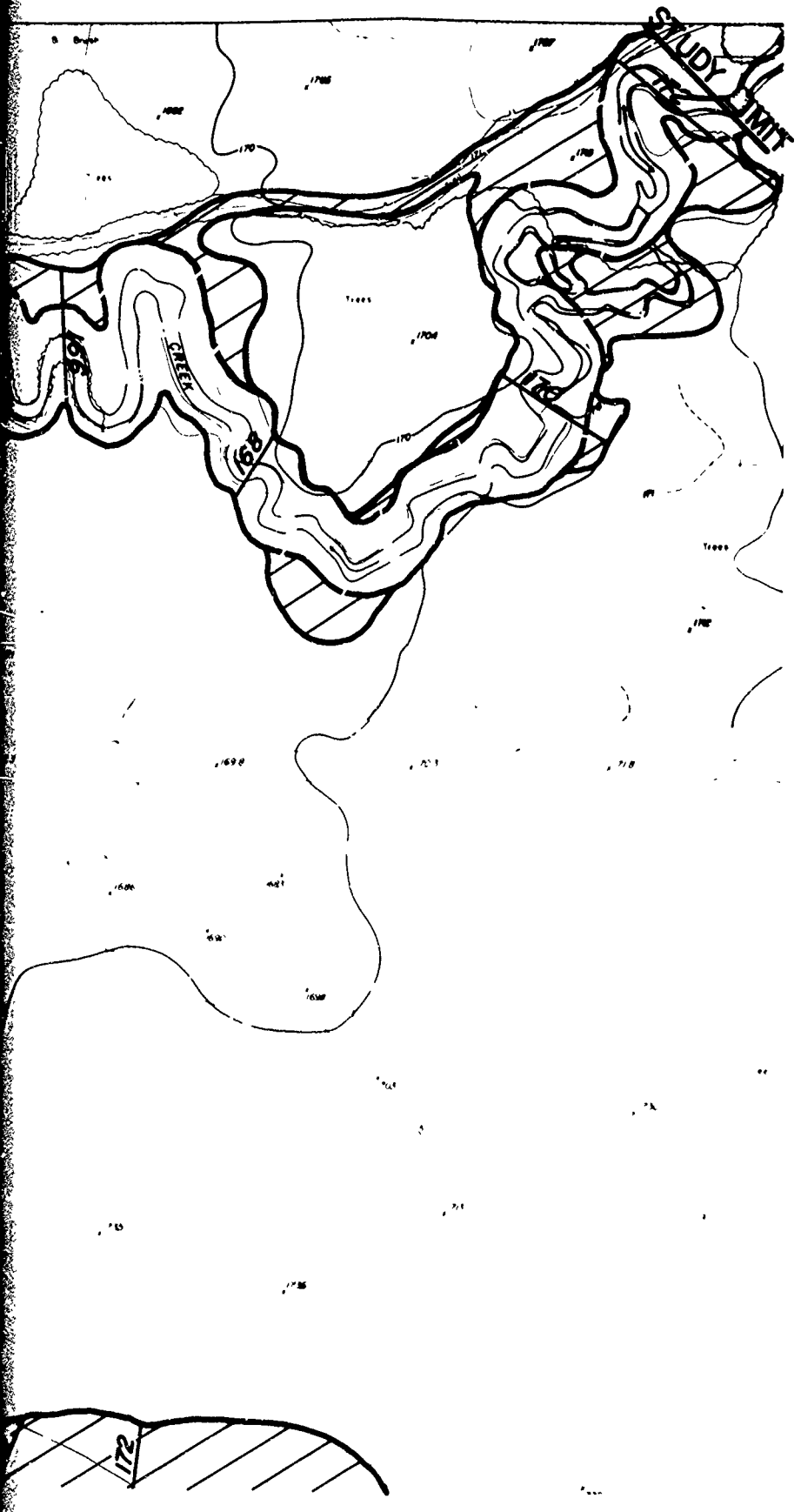

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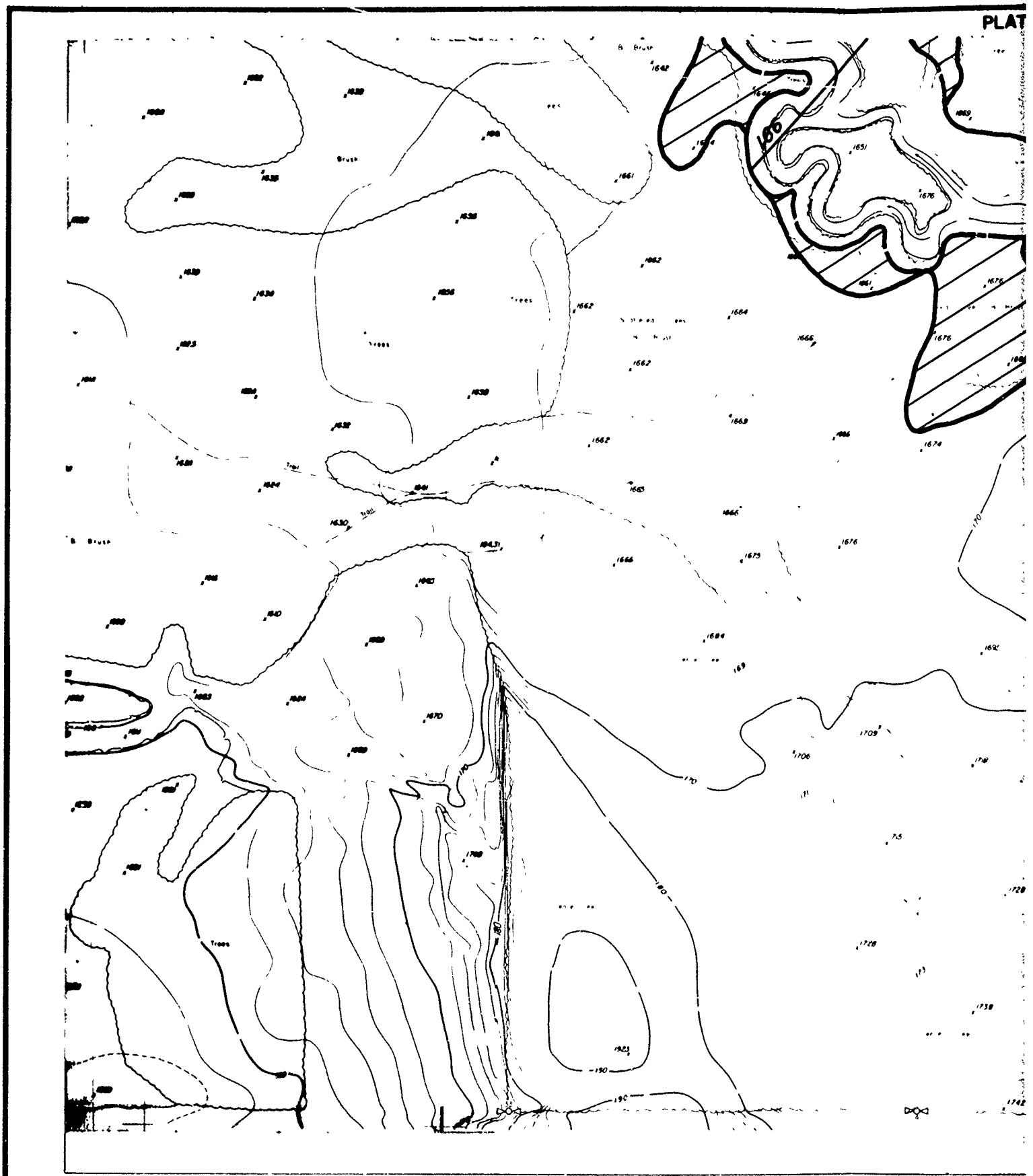
ANCHORAGE, ALASKA

MAY 1975

PLATE 16



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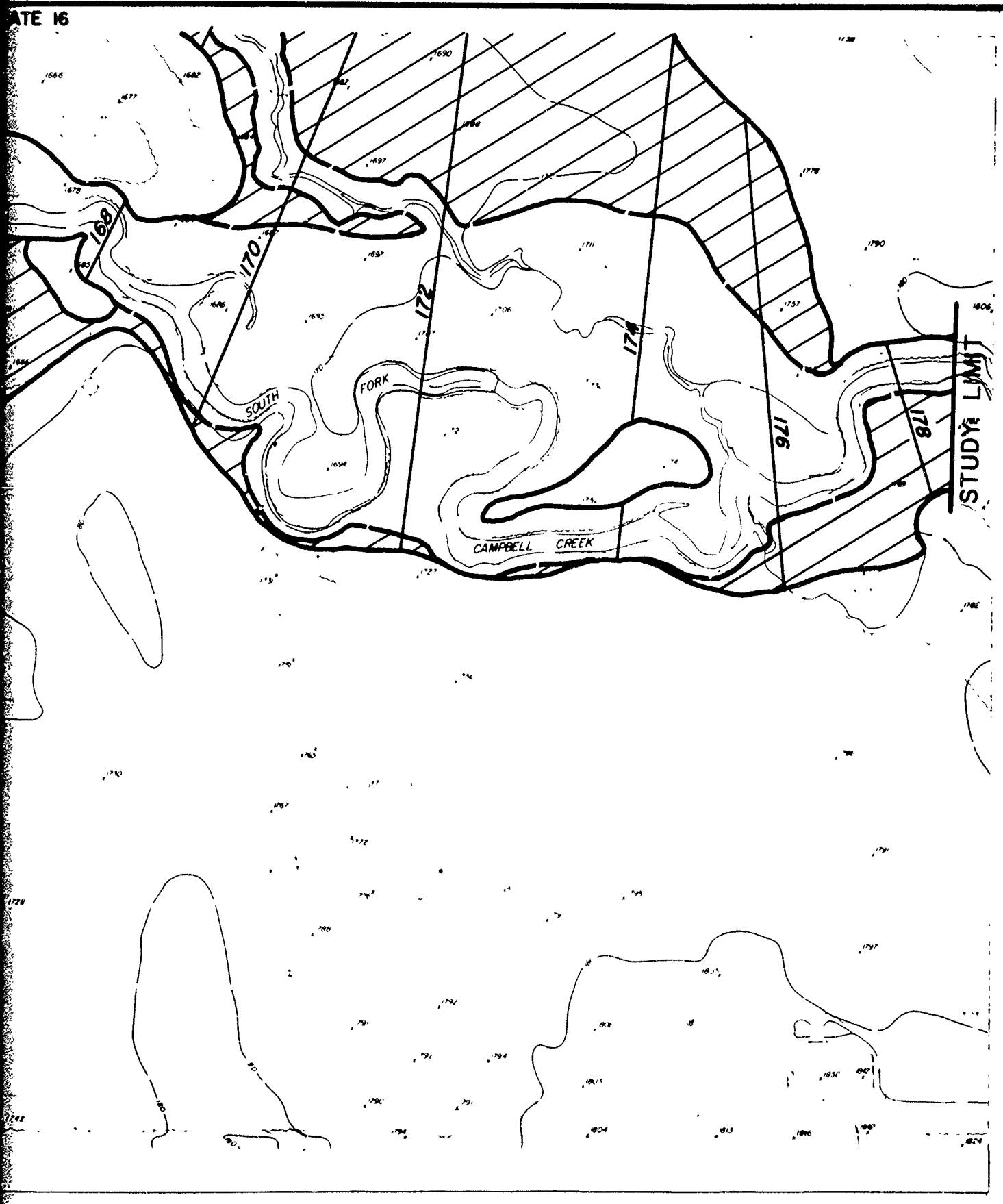

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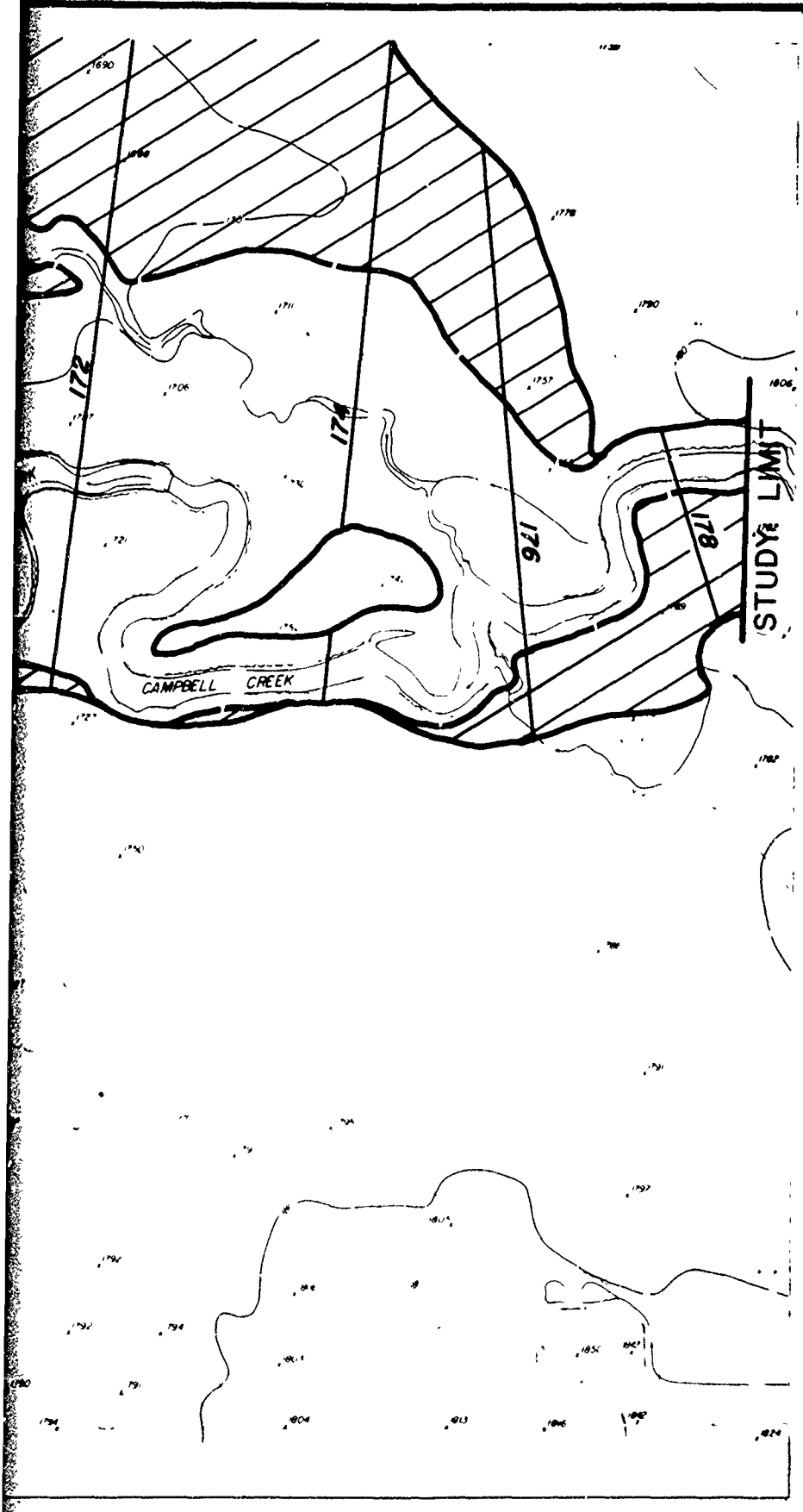

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ALASKA

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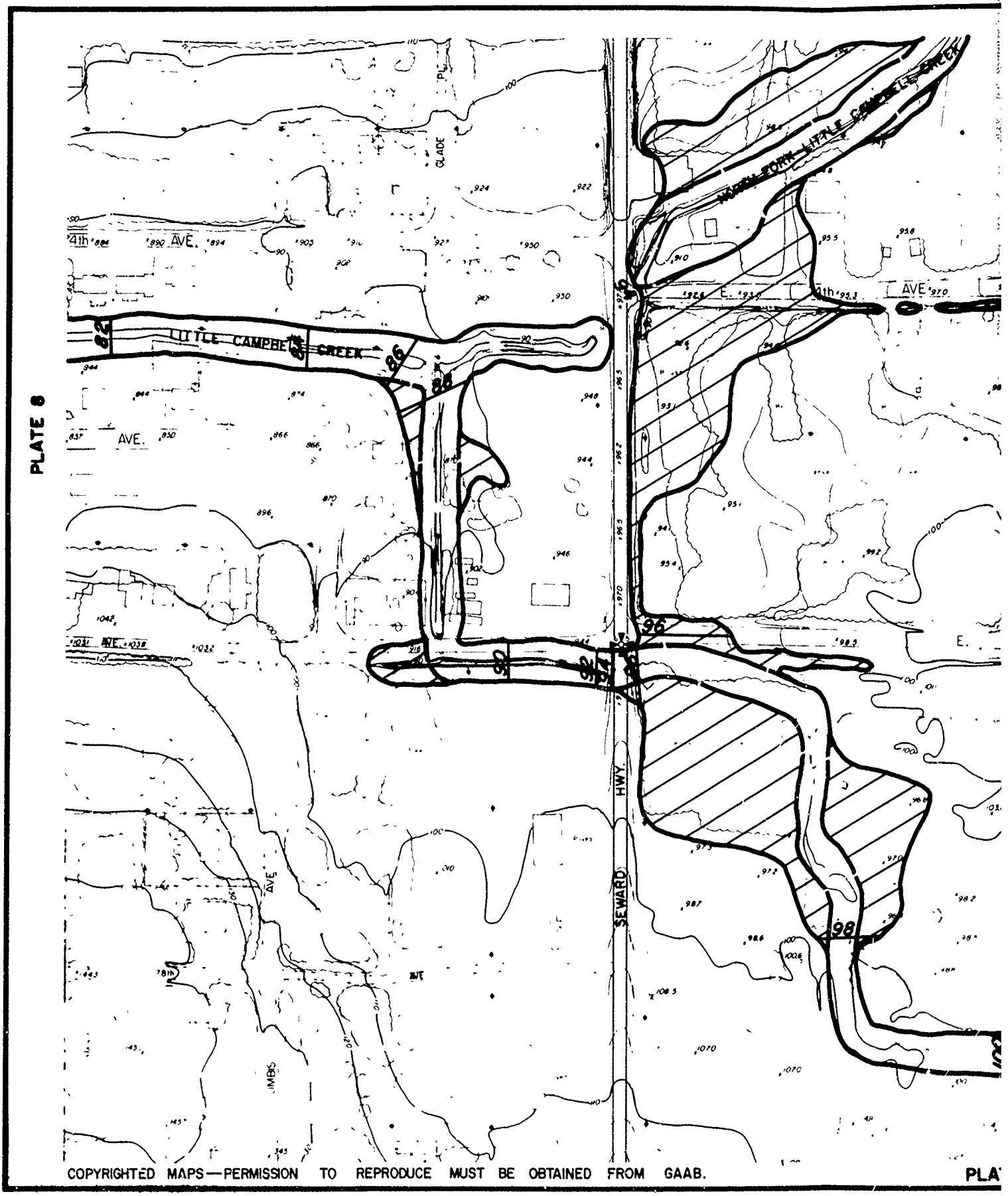
ANCHORAGE, ALASKA

MAY 1975

PLATE 17



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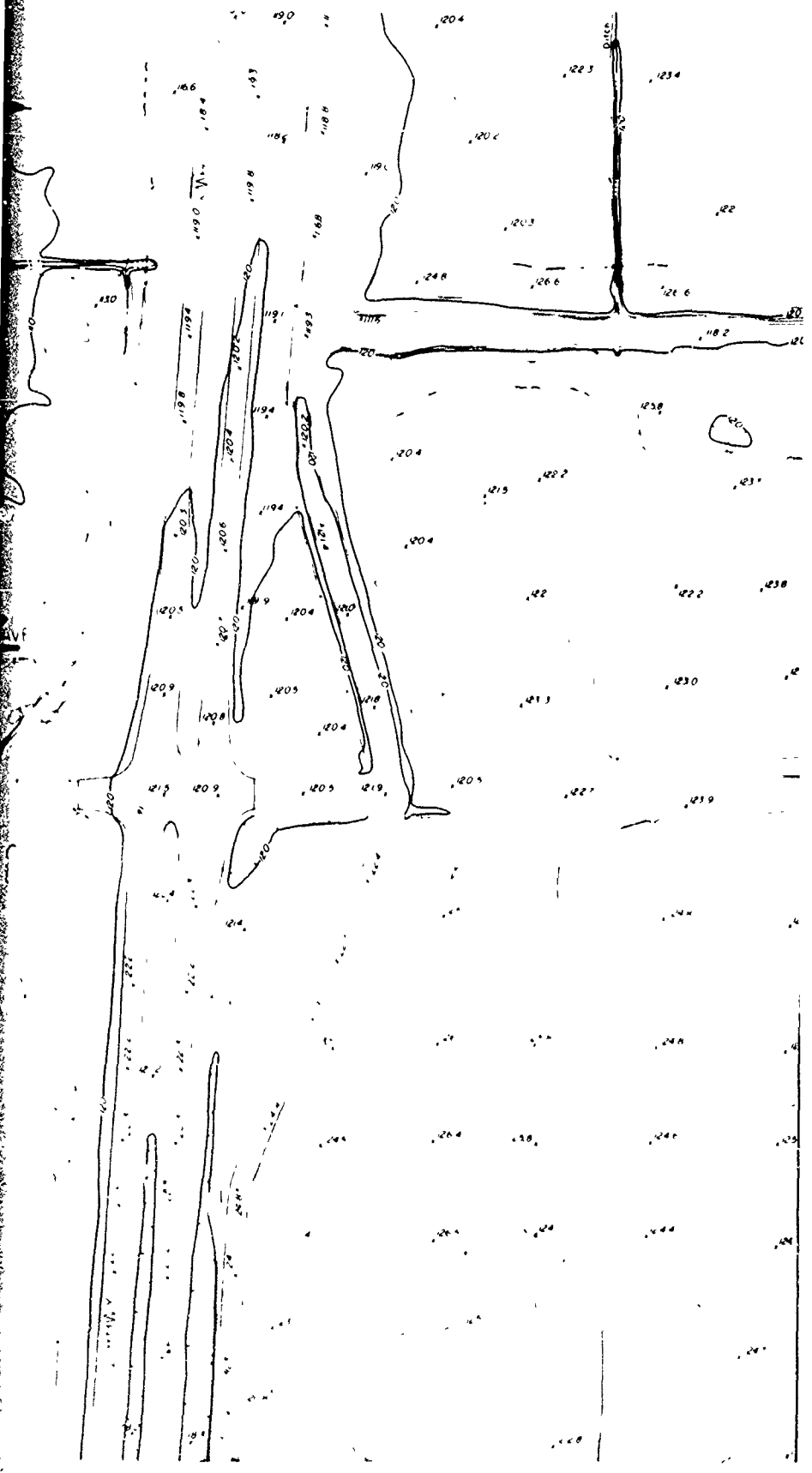

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ANCHORAGE, ALASKA

MAY 1975

PLATE 18

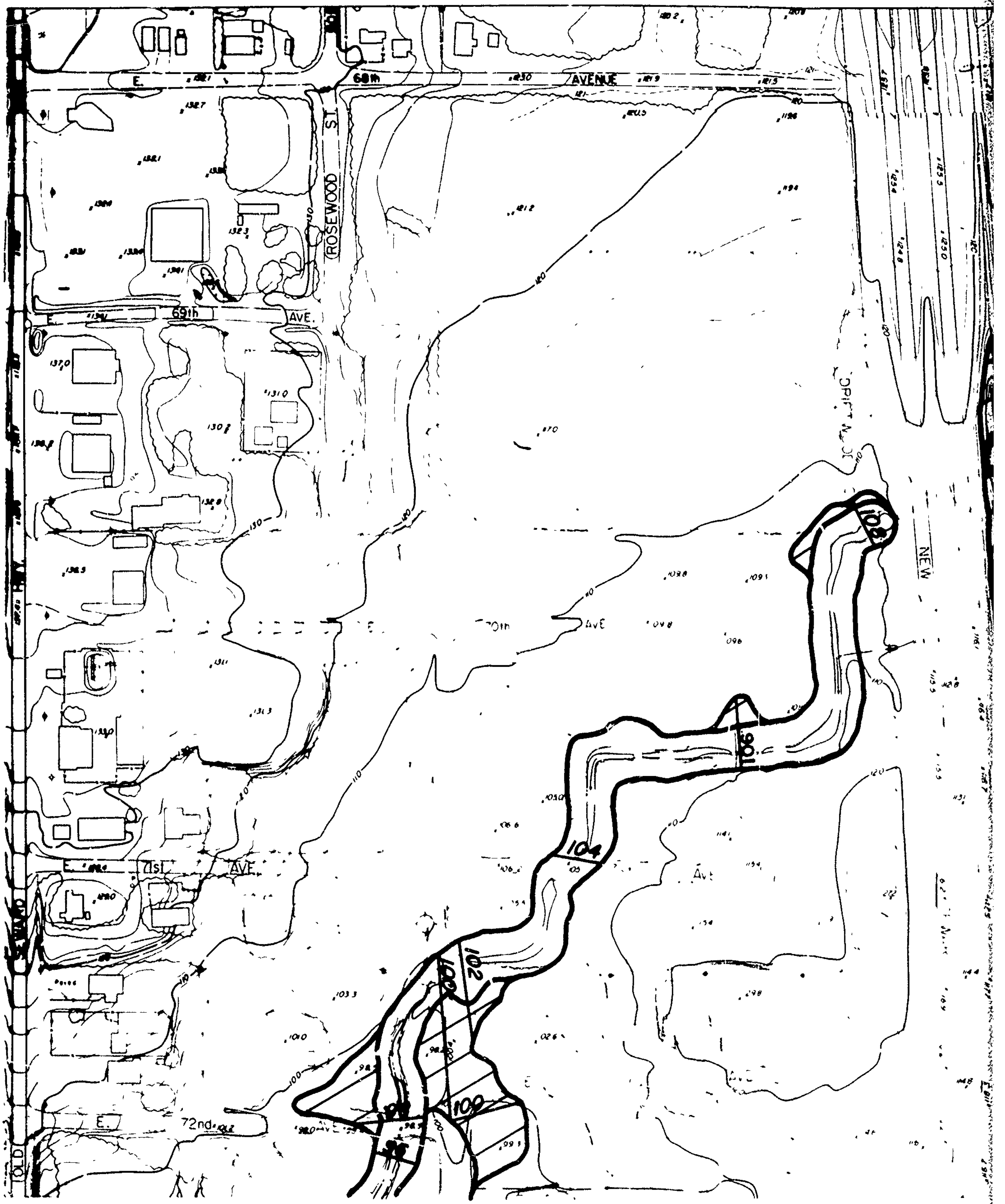
E. 68th AVENUE
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PLATE 16

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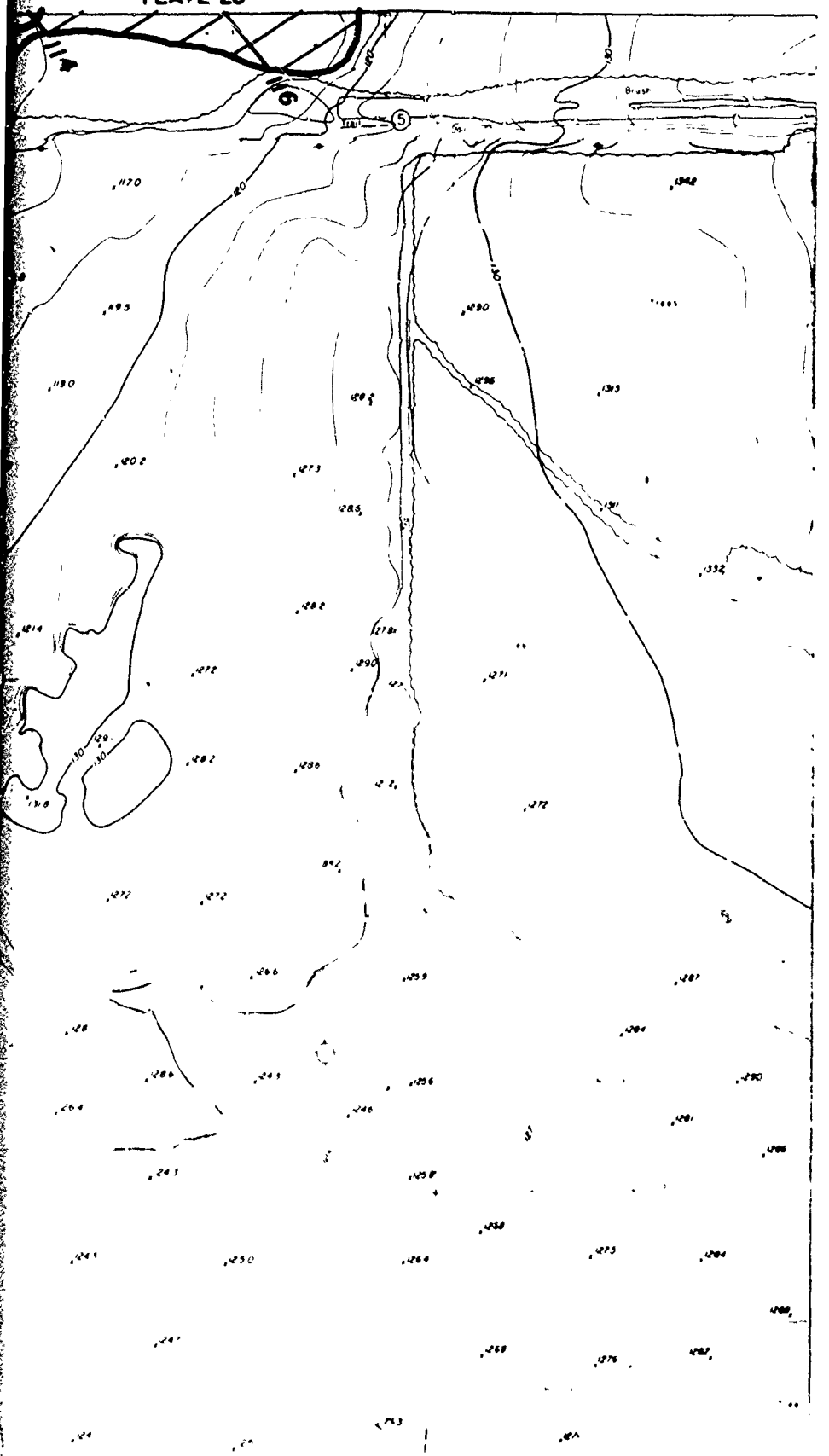

LEGEND

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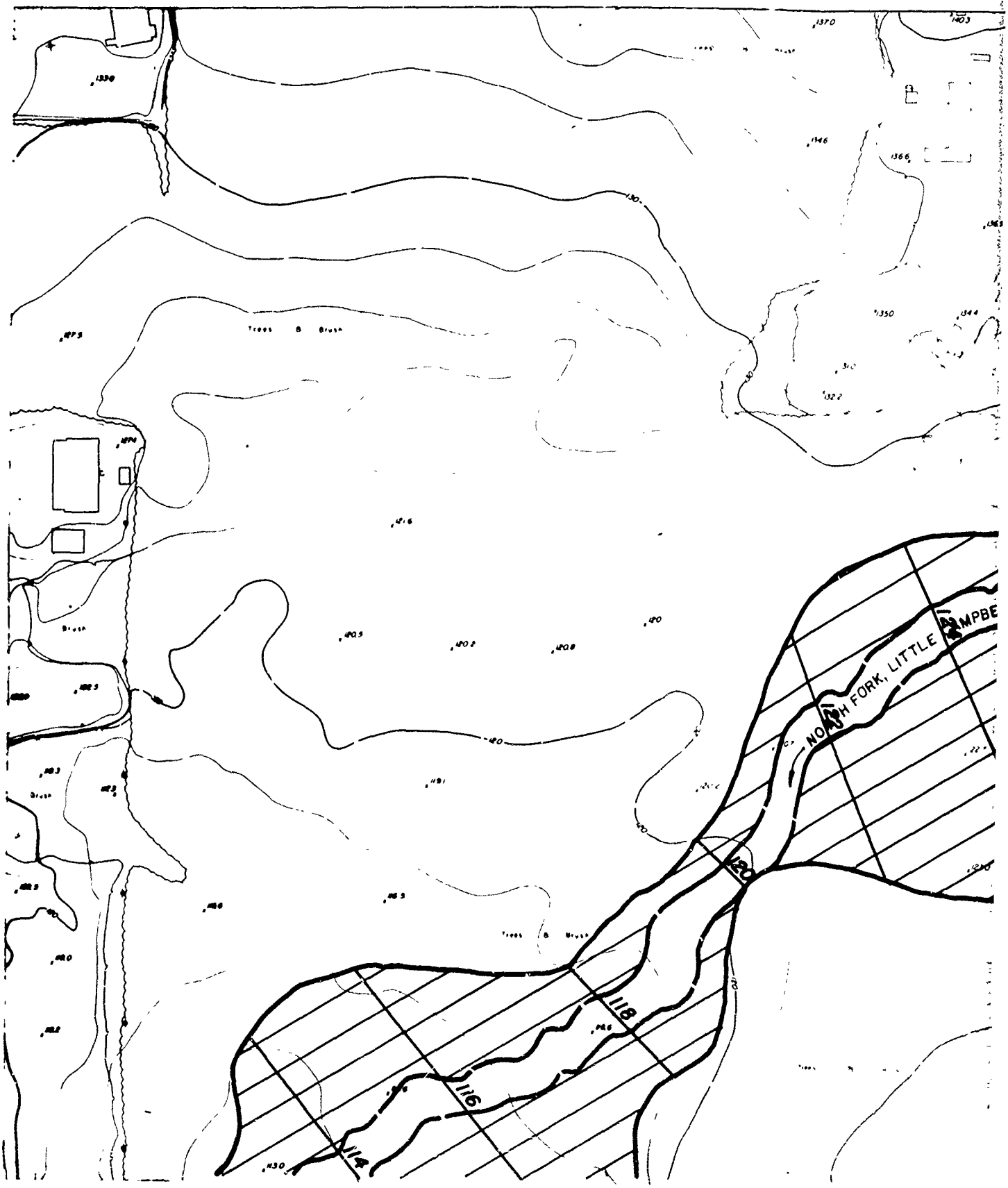
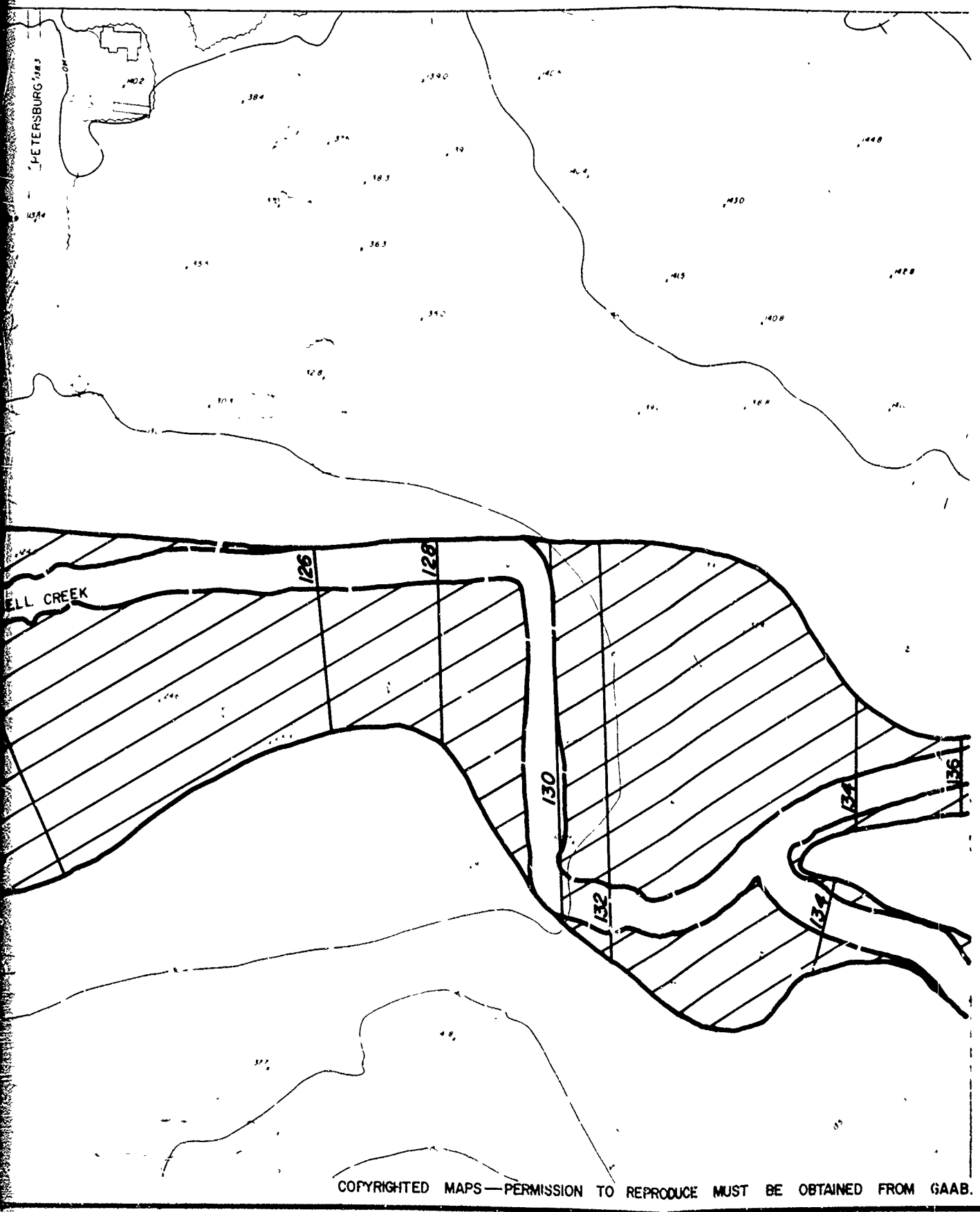


PLATE 19



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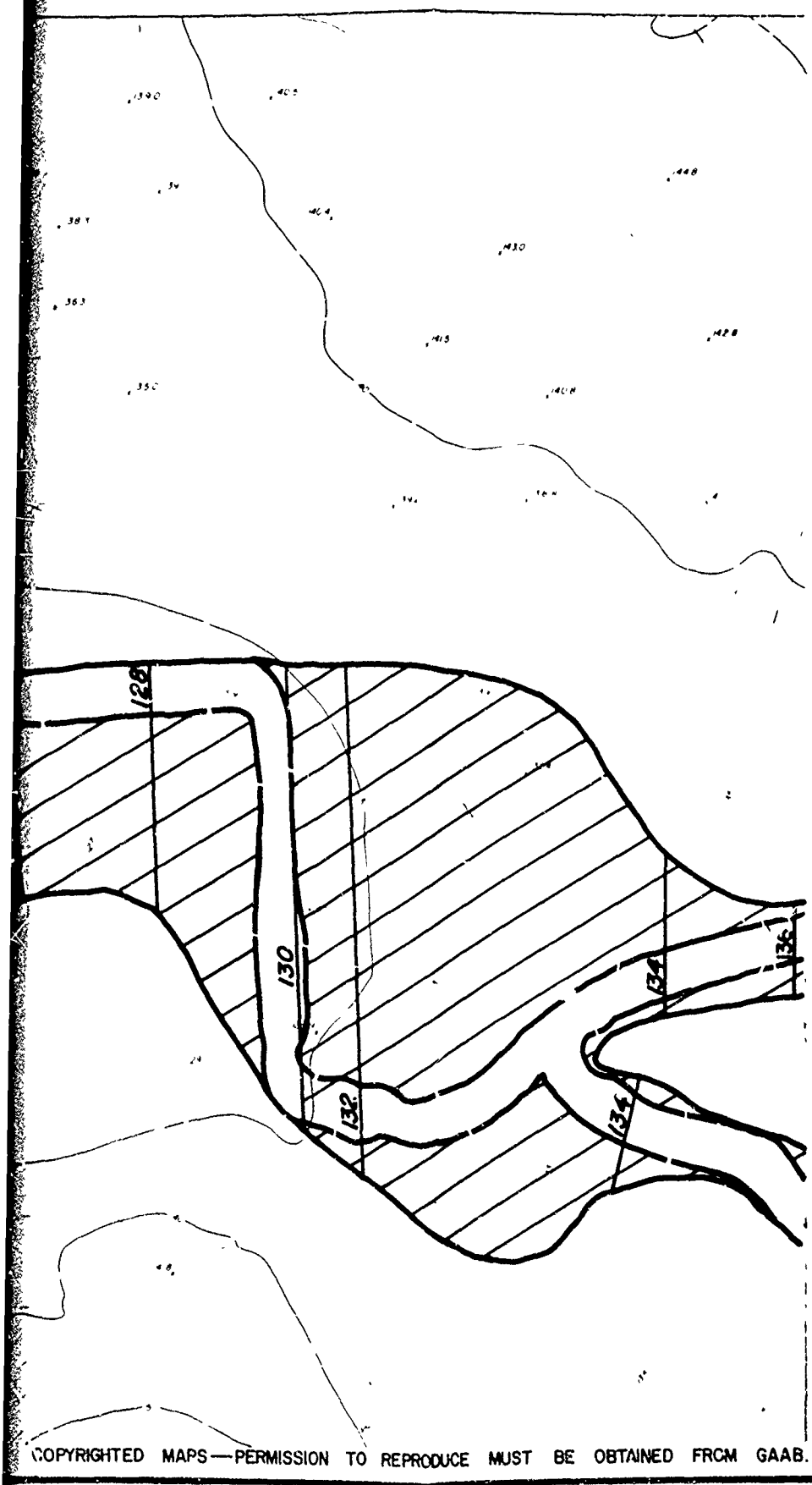

PLATE 21

LEGEND

OVERFLOW LIMITS

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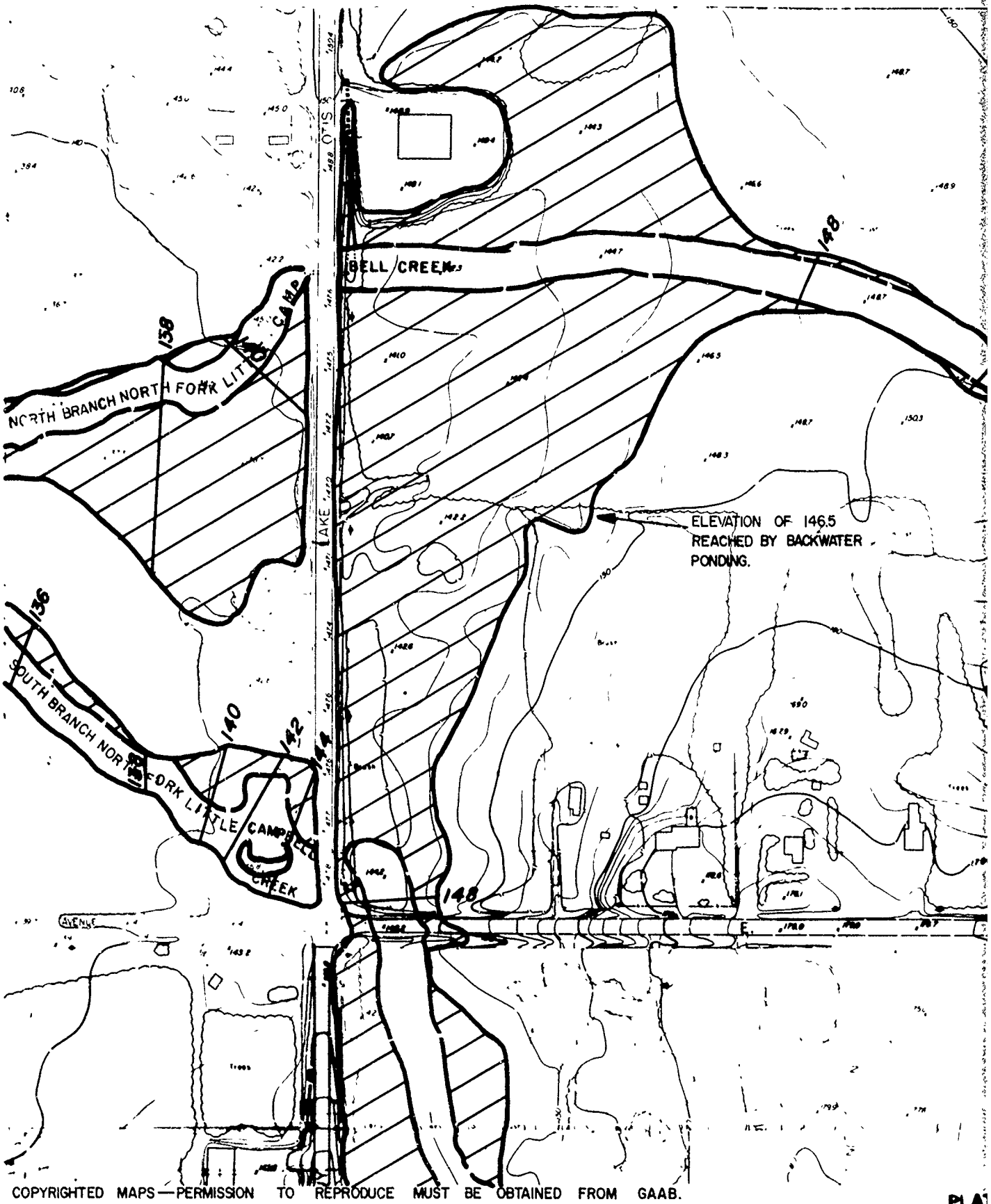
PLATE 20



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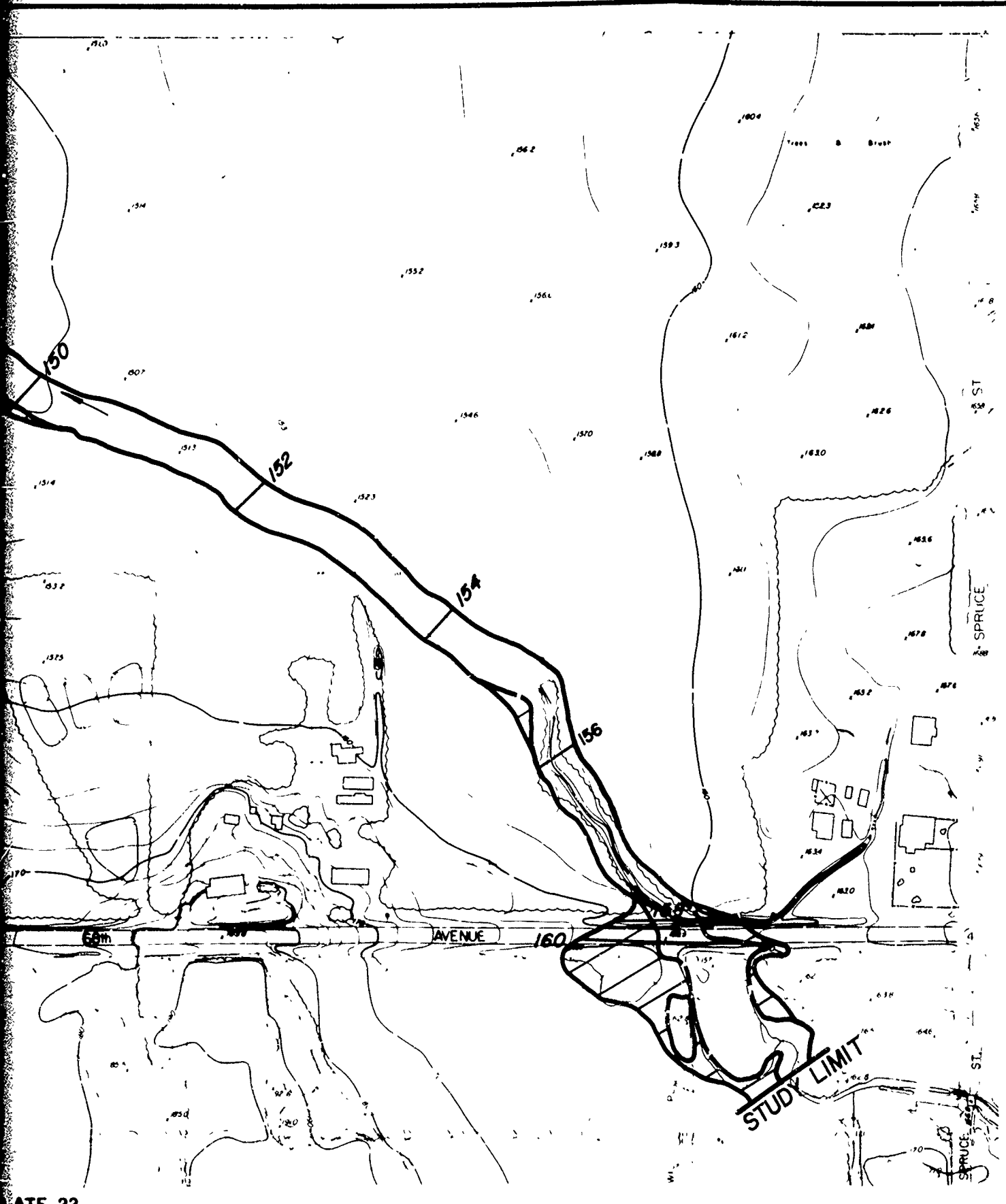

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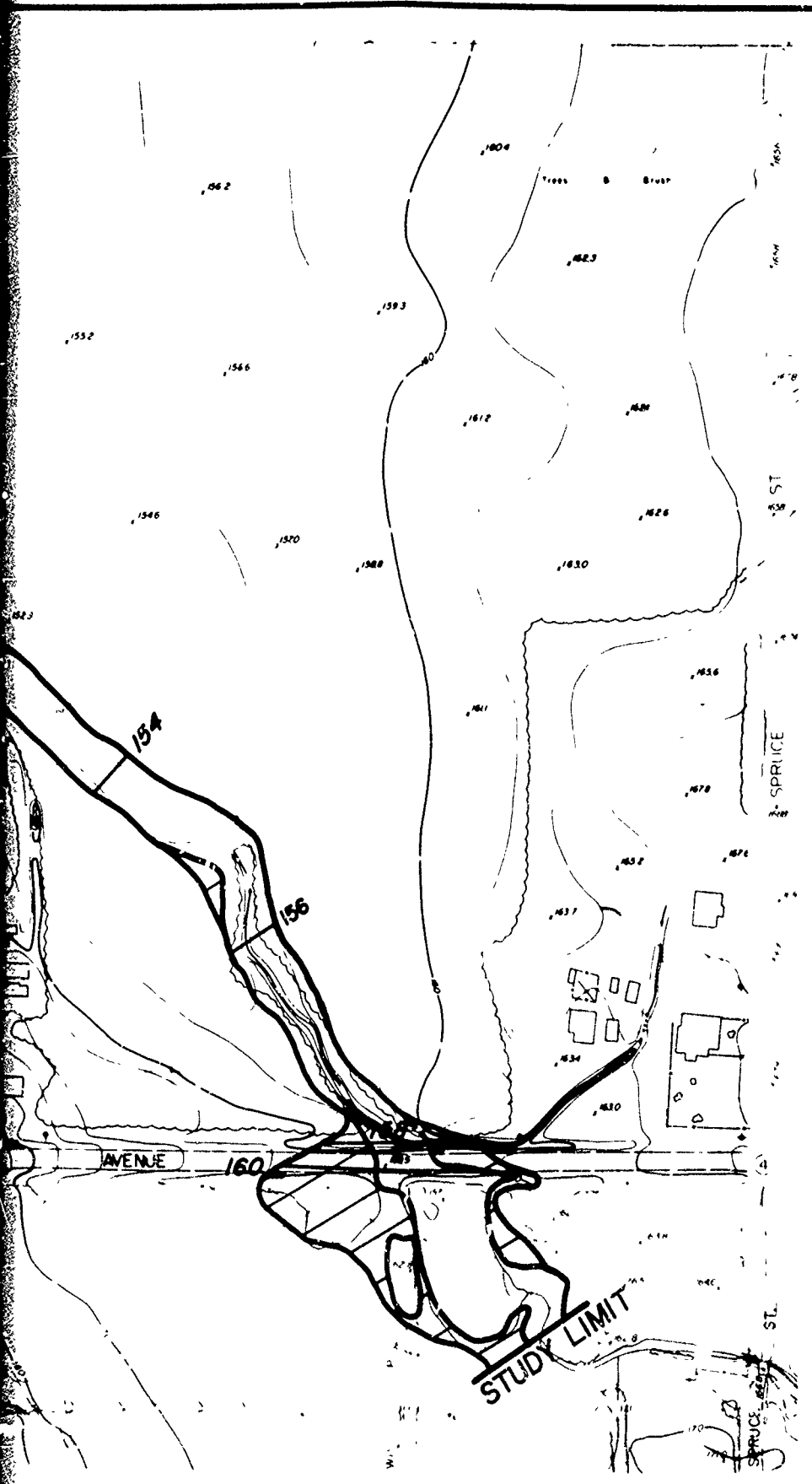

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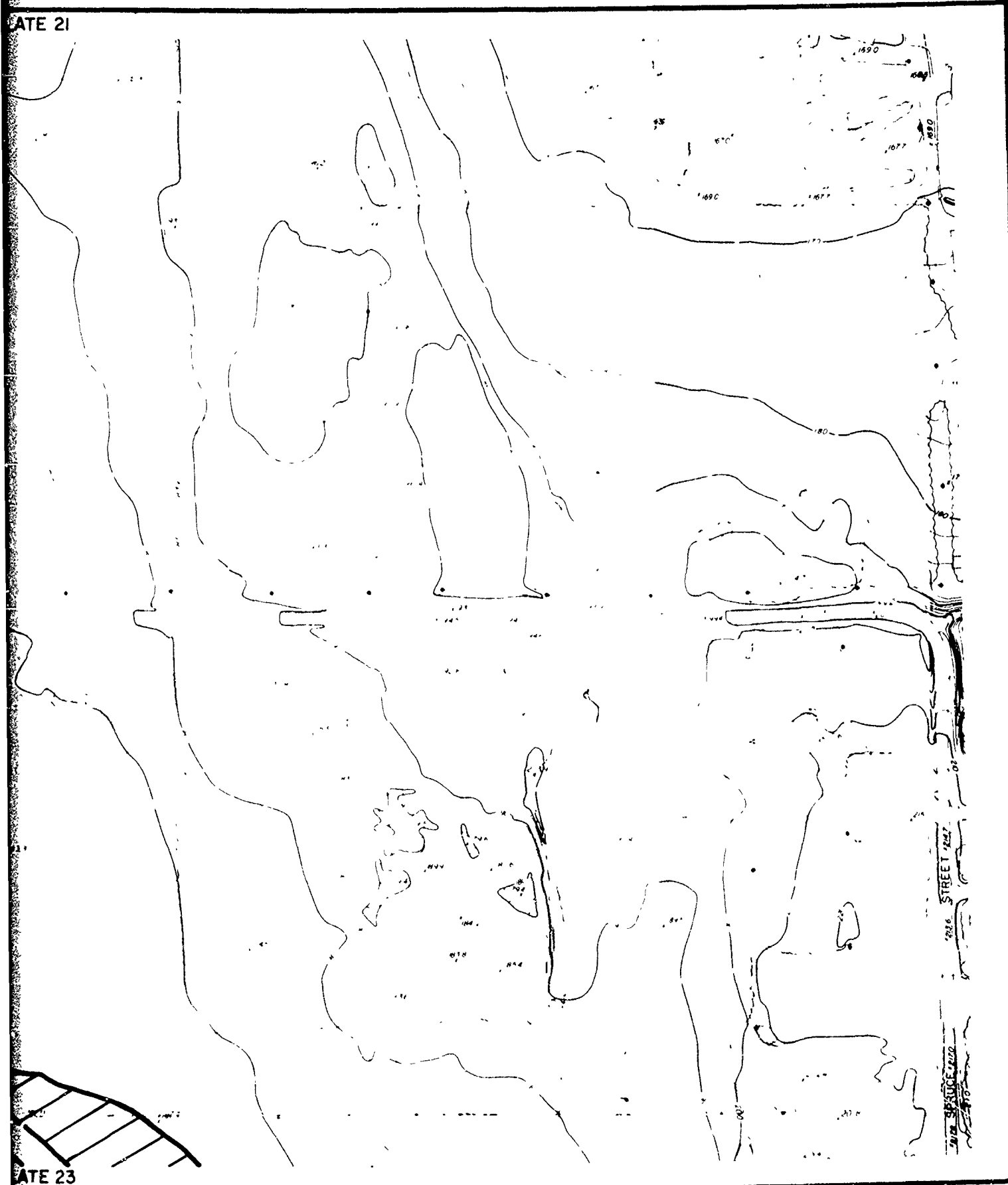

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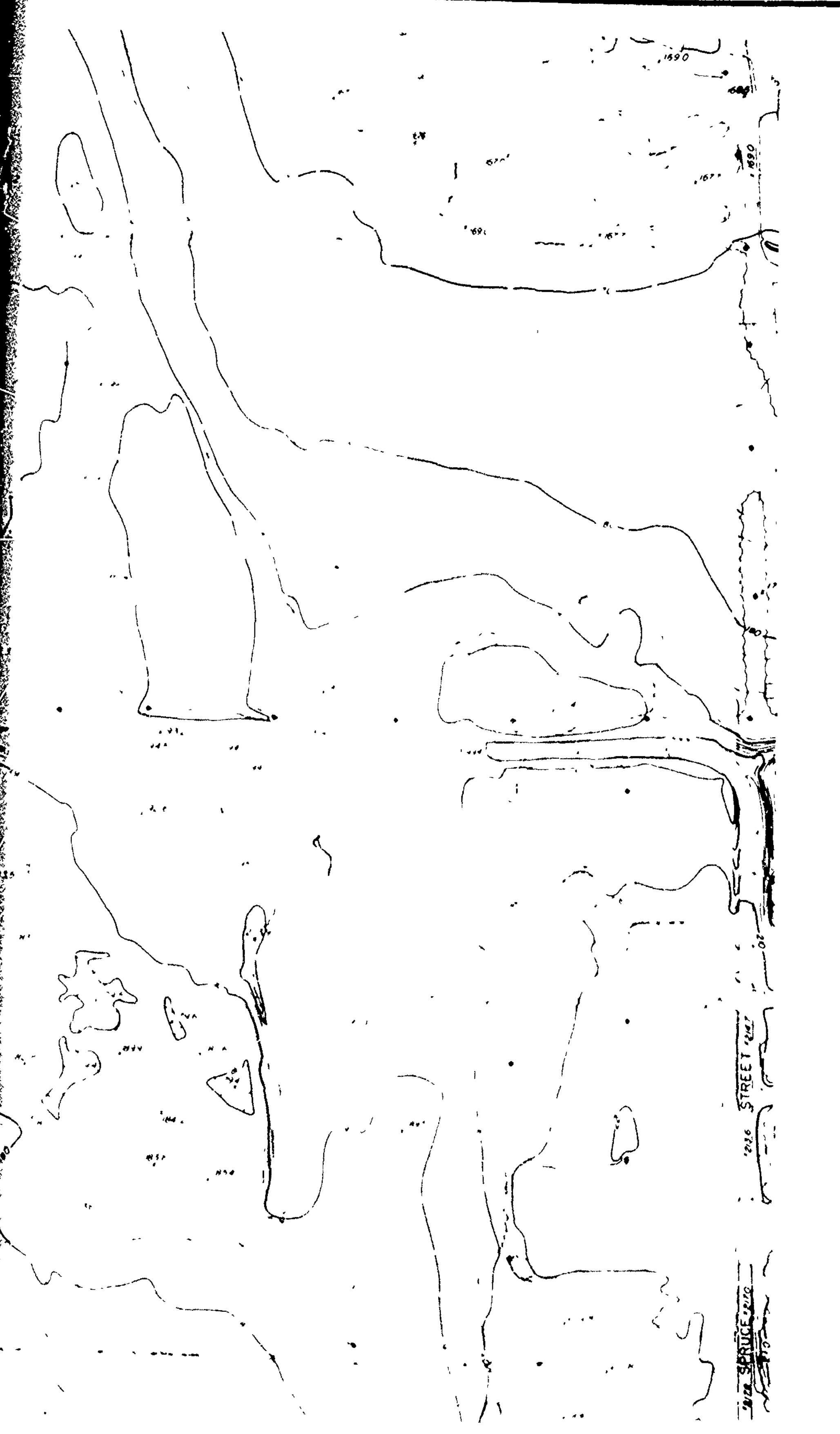

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PREPARED BY THE DEPARTMENT OF THE ARMY ALASKA DISTRICT, CORPS OF ENGINEERS ANCHORAGE, ALASKA

MAY 1975

PLATE 22

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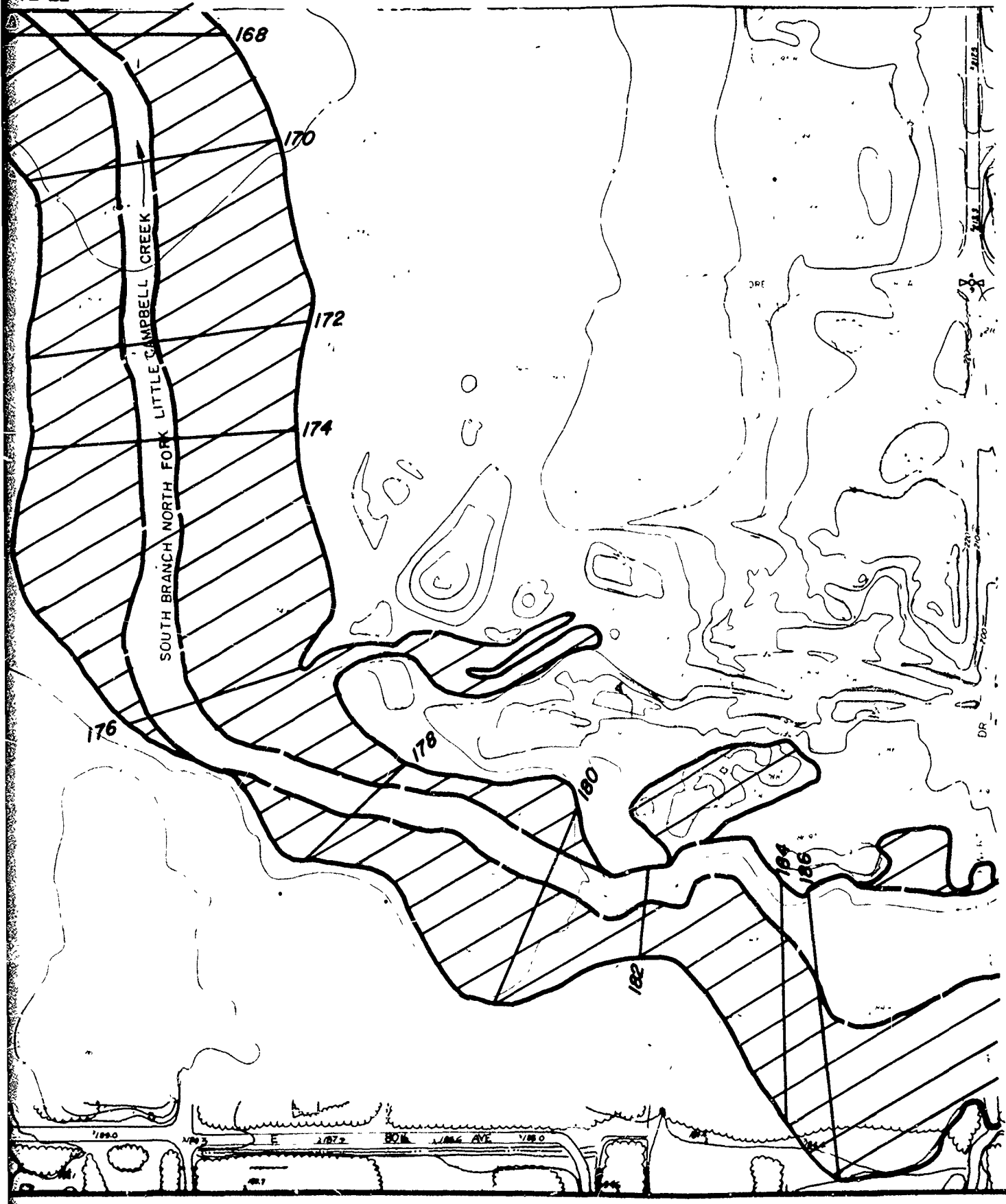

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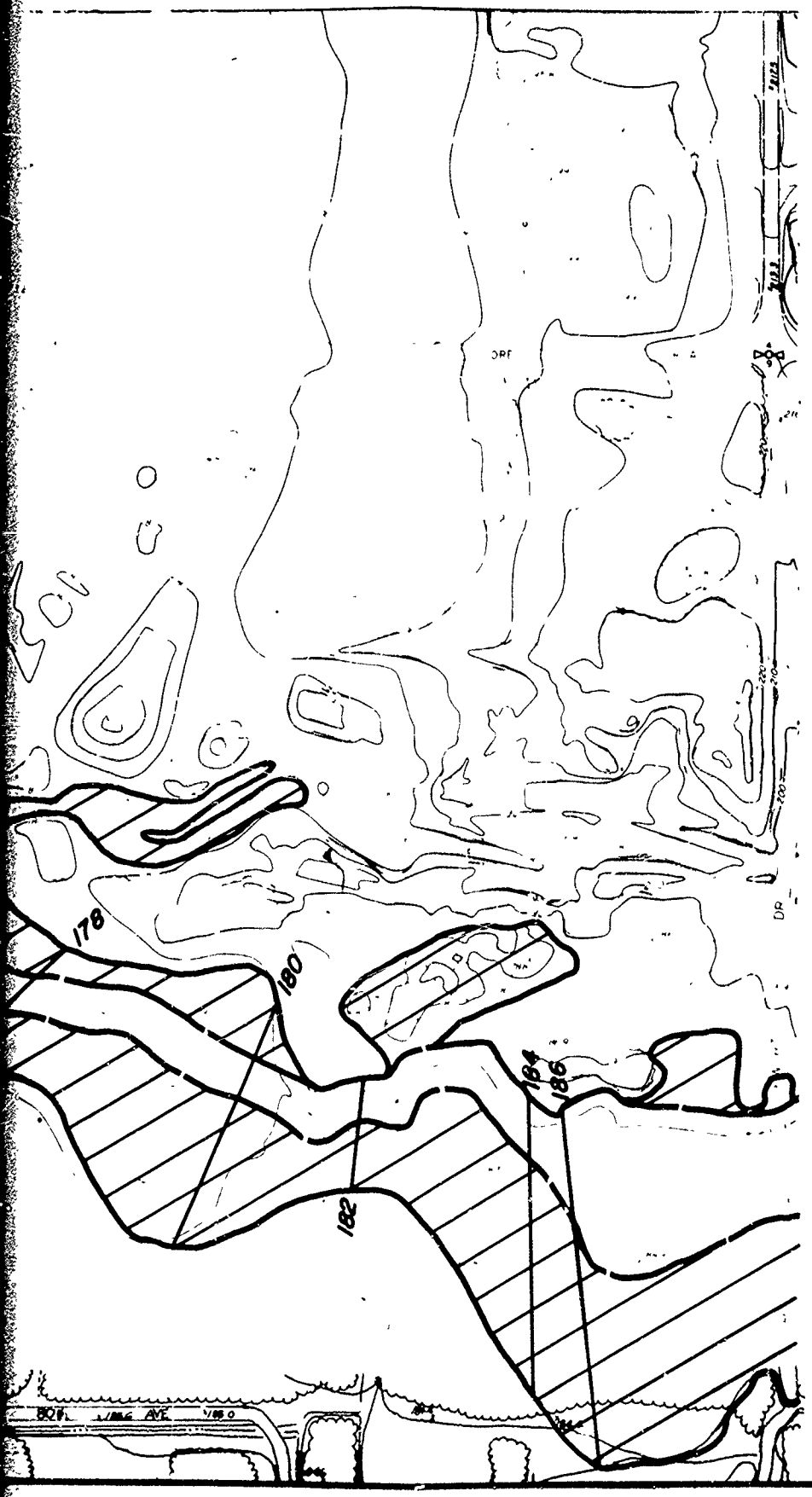

PLATE 24

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PREPARED BY THE
DEPARTMENT OF THE ARMY
ALASKA DISTRICT, CORPS OF ENGINEERS
ANCHORAGE, ALASKA

MAY 1975

PLATE 23

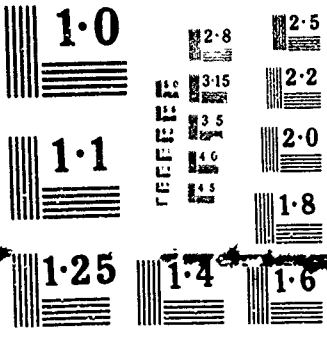
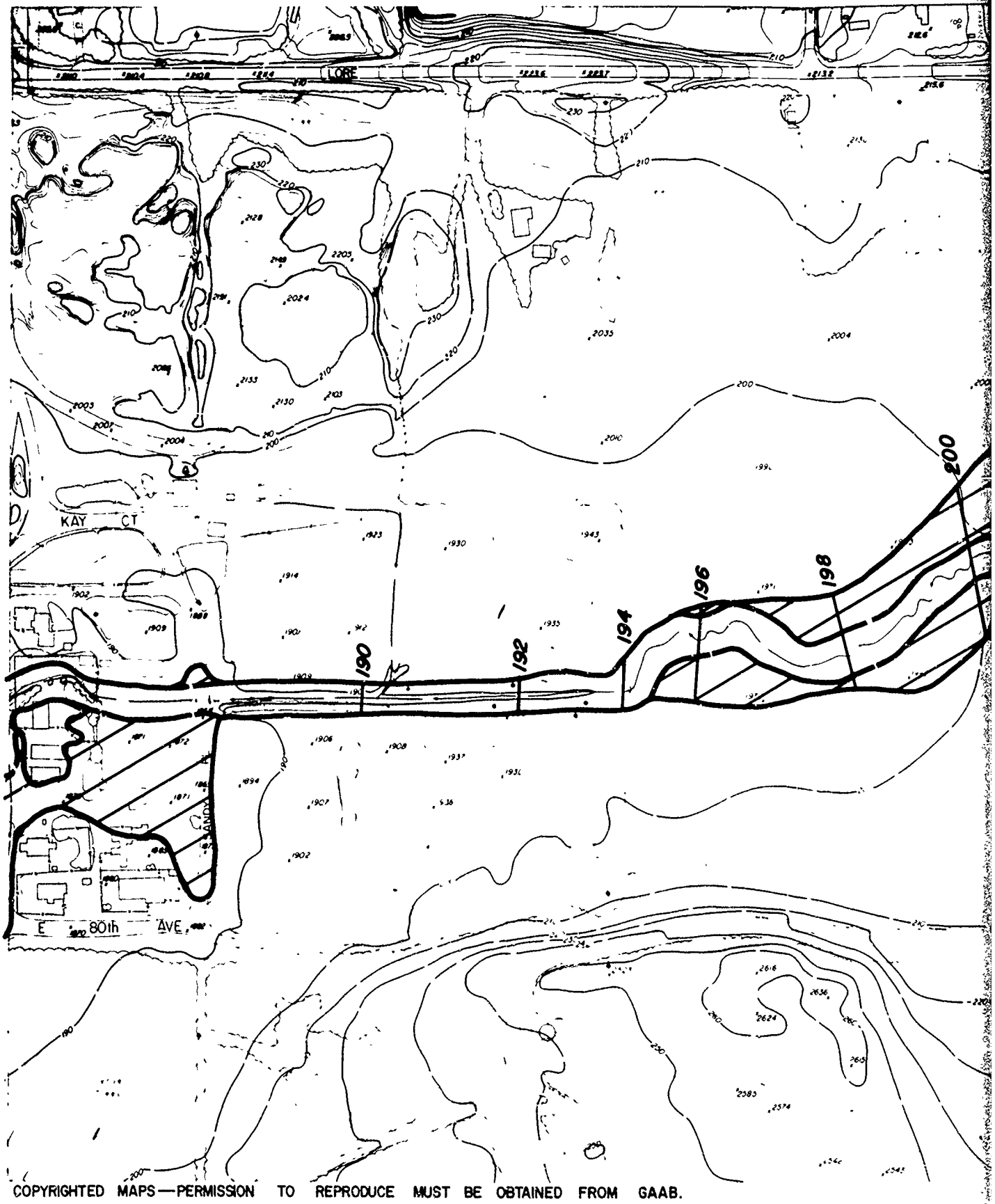
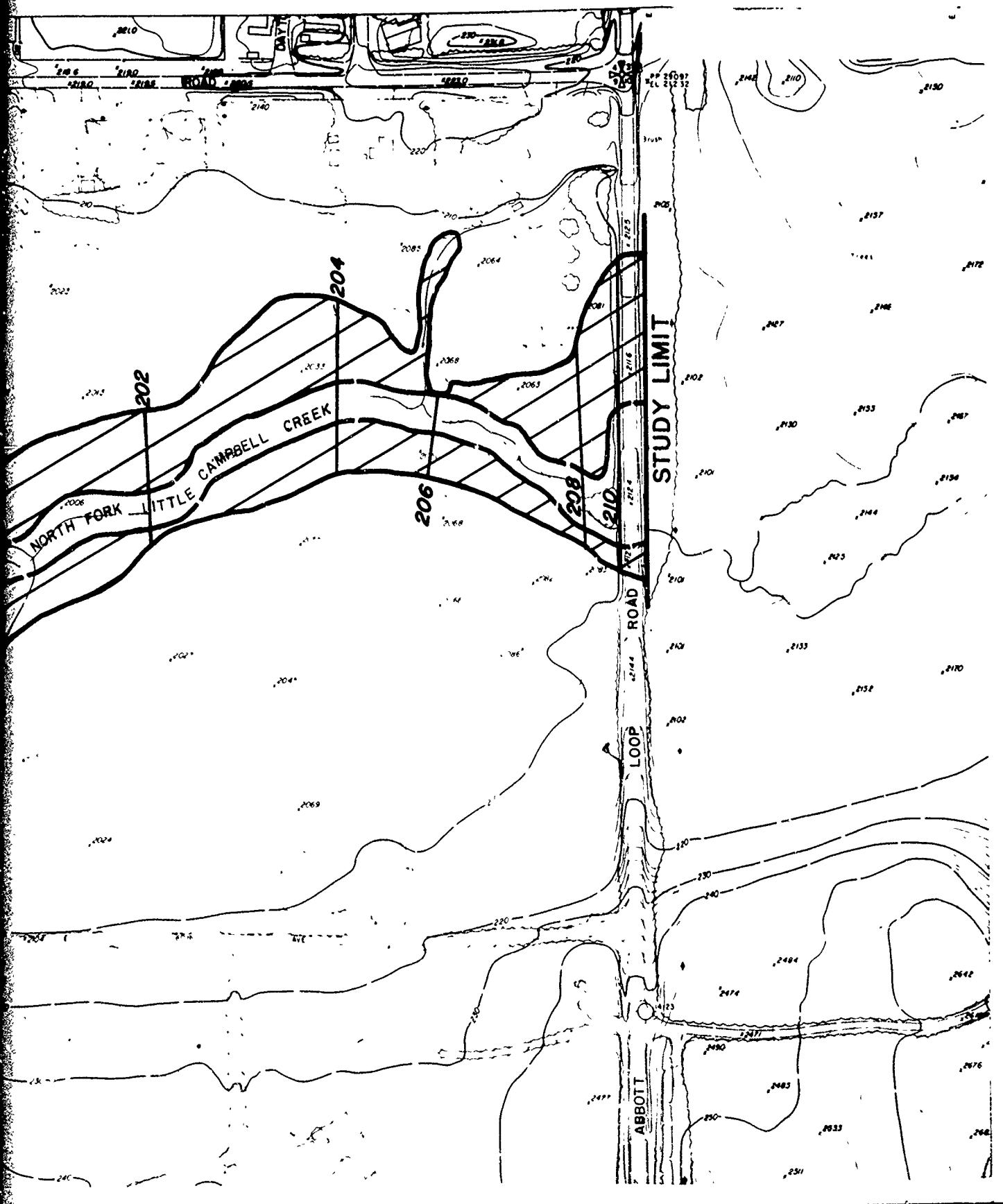


PLATE 23





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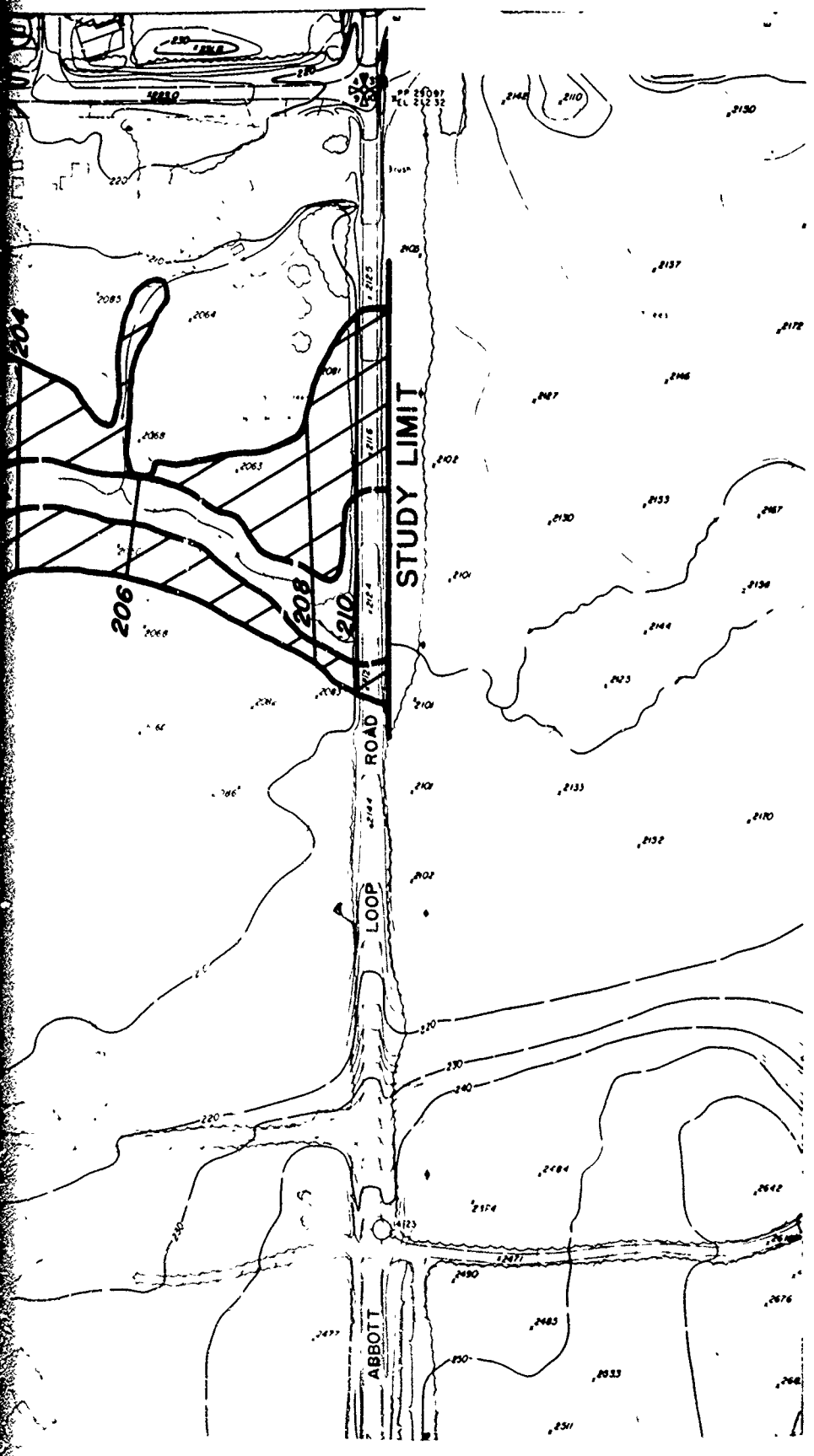

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS — INTERMEDIATE REGIONAL FLOOD (IRF)

56 — APPROXIMATE WATER SURFACE ELEVATION DURING IRF

—250— GROUND ELEVATION G.A.A.B. POST QUAKE DATUM (MSL 1972)

NOTES

1. MAPS USED FOR PLATES PROVIDED BY G.A.A.B. AND SHOW EXISTING CONDITION AS OF OCT. 1973.
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0' 200' 400'

SCALE IN FEET

FLOODED AREA MAP
SPECIAL FLOOD HAZARD REPORT
CAMPBELL CREEK
GREATER ANCHORAGE AREA BOROUGH
ALASKA

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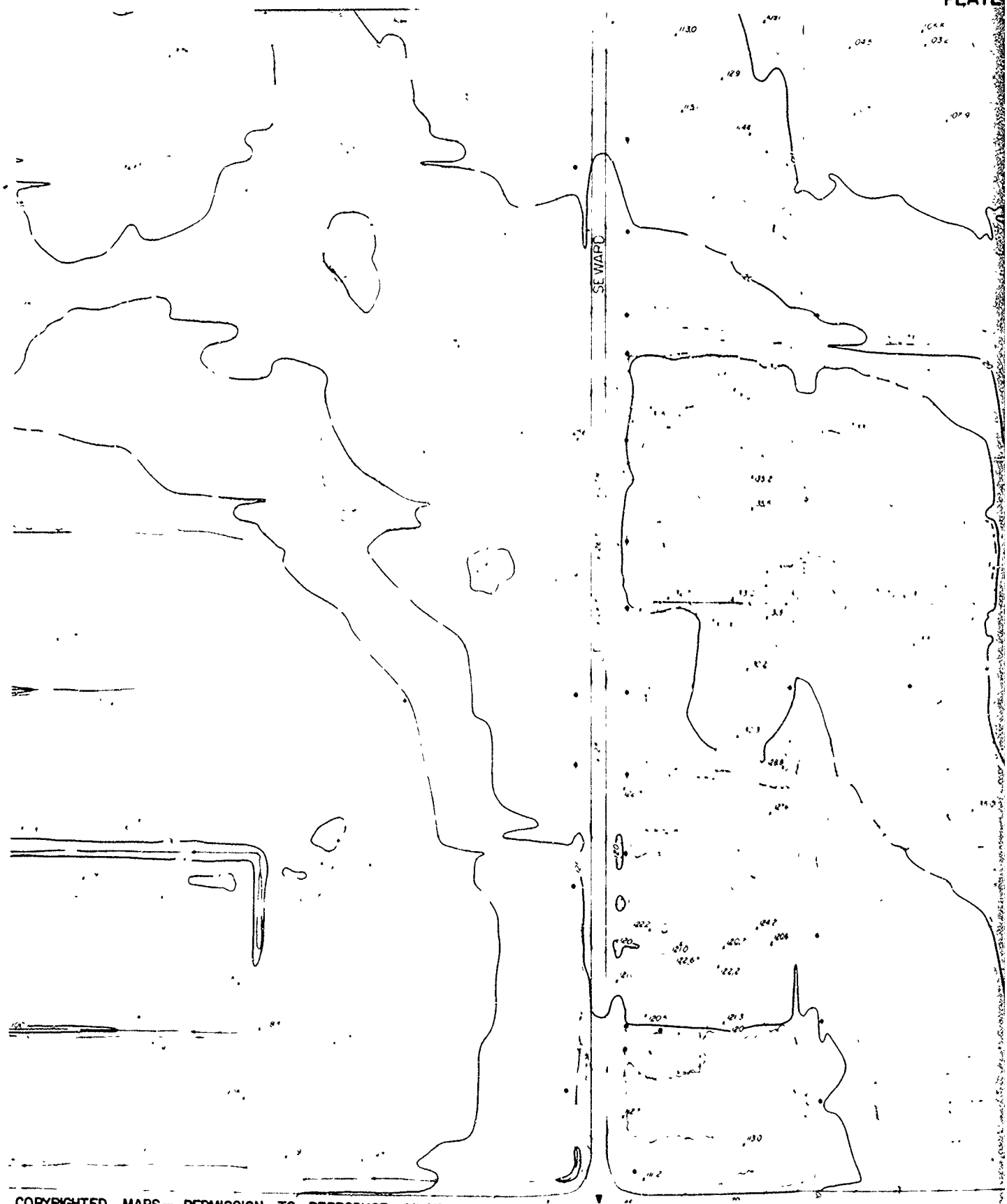
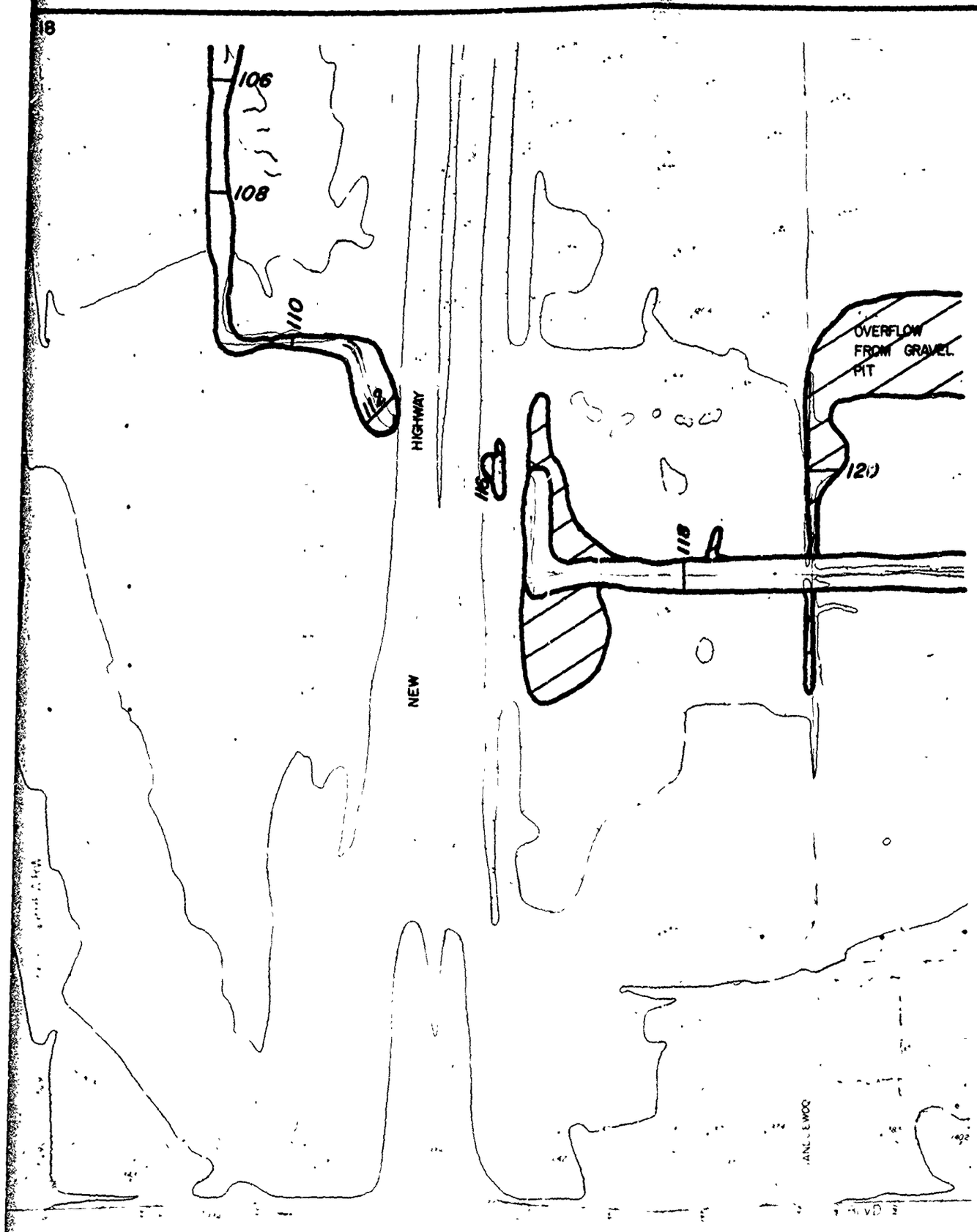
MAY 1975

PLATE





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NOTES

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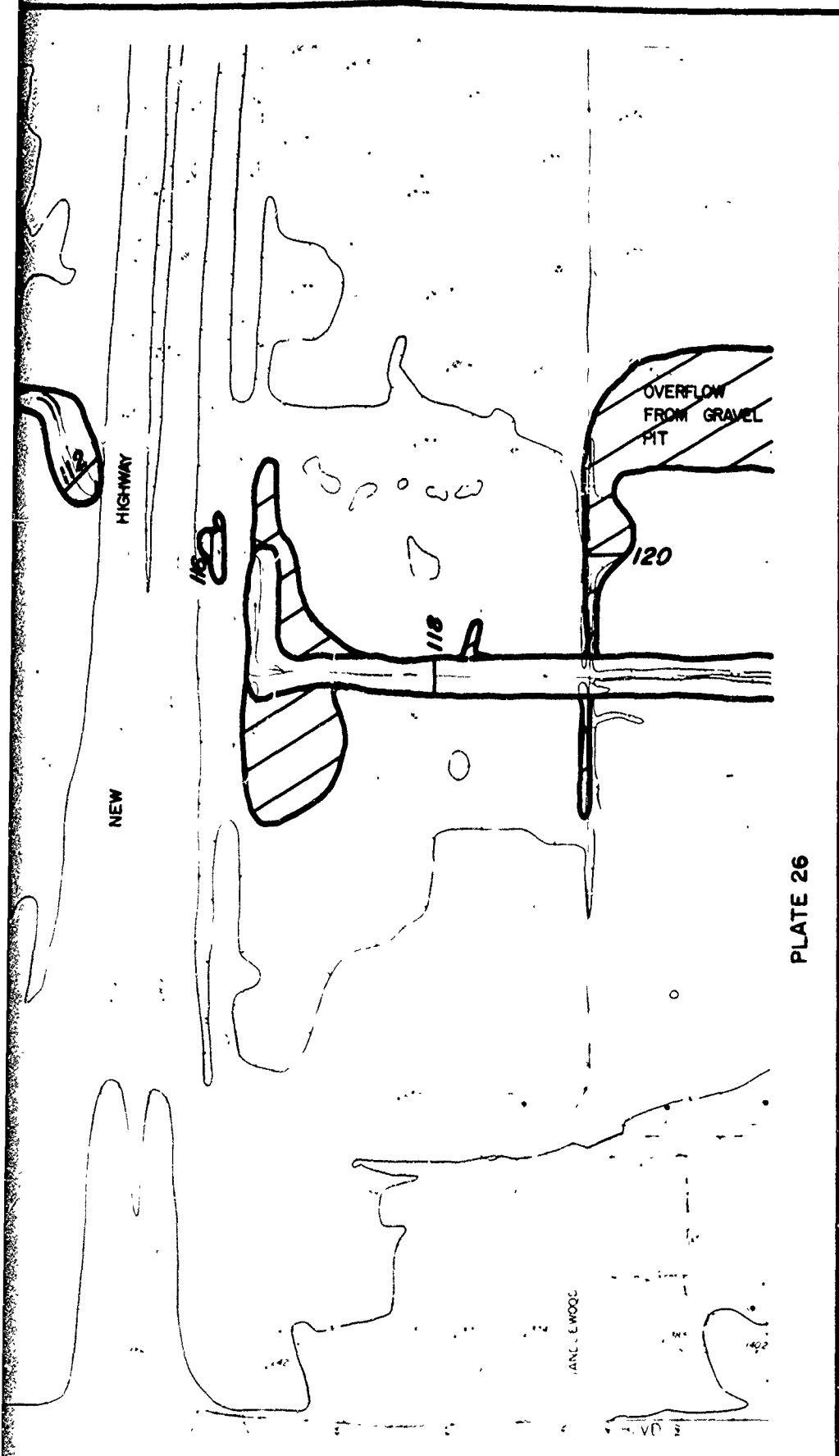

PLATE 26

LEGEND

OVERFLOW LIMITS

FLOODWAY LIMITS — INTERMEDIATE REGIONAL FLOOD (IRF)

56 — APPROXIMATE WATER SURFACE ELEVATION DURING IRF

—250— GROUND ELEVATION G A A B POST QUAKE DATUM (MSL 1972)

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GREATER ANCHORAGE AREA BOROUGH
ALASKA

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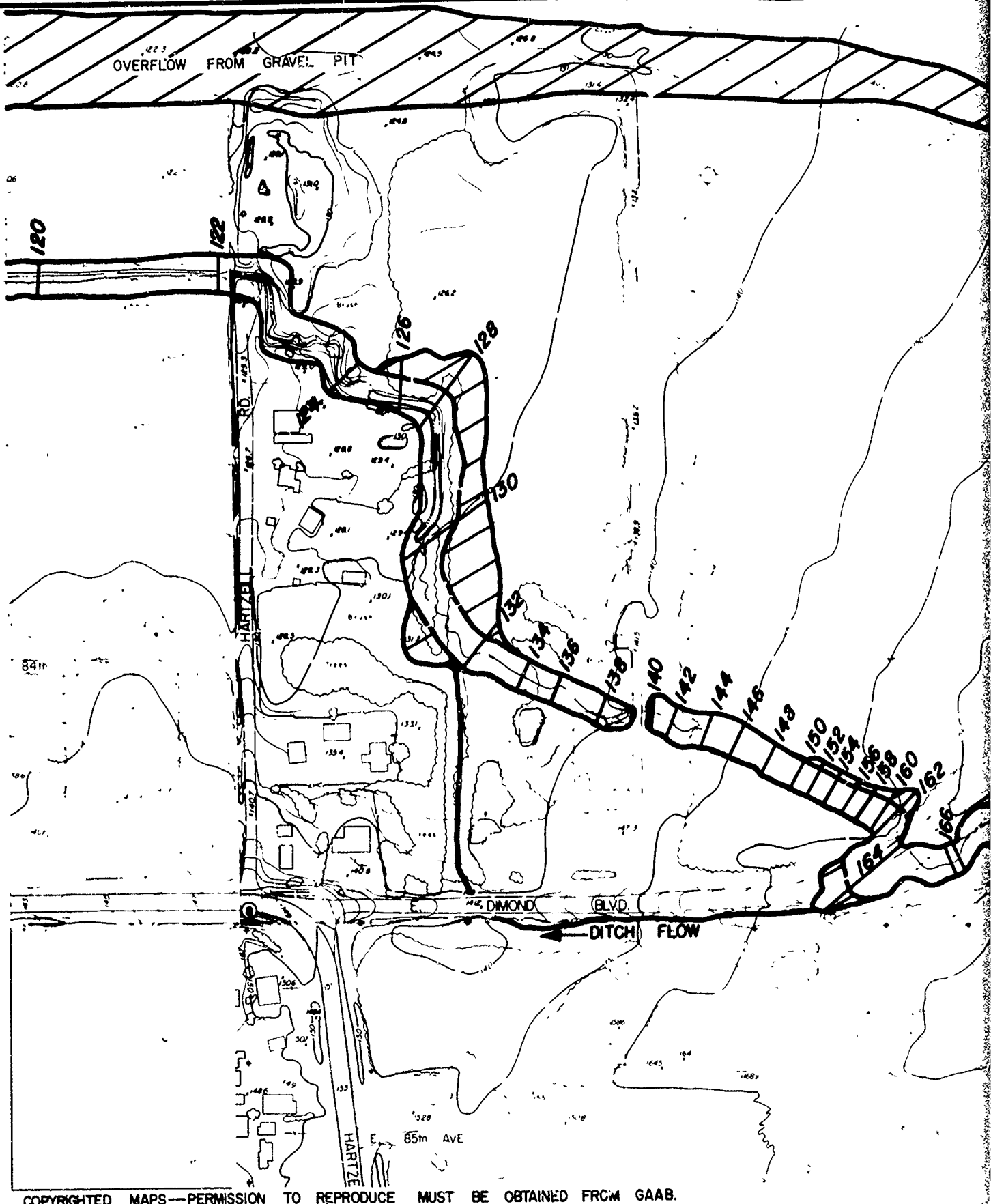
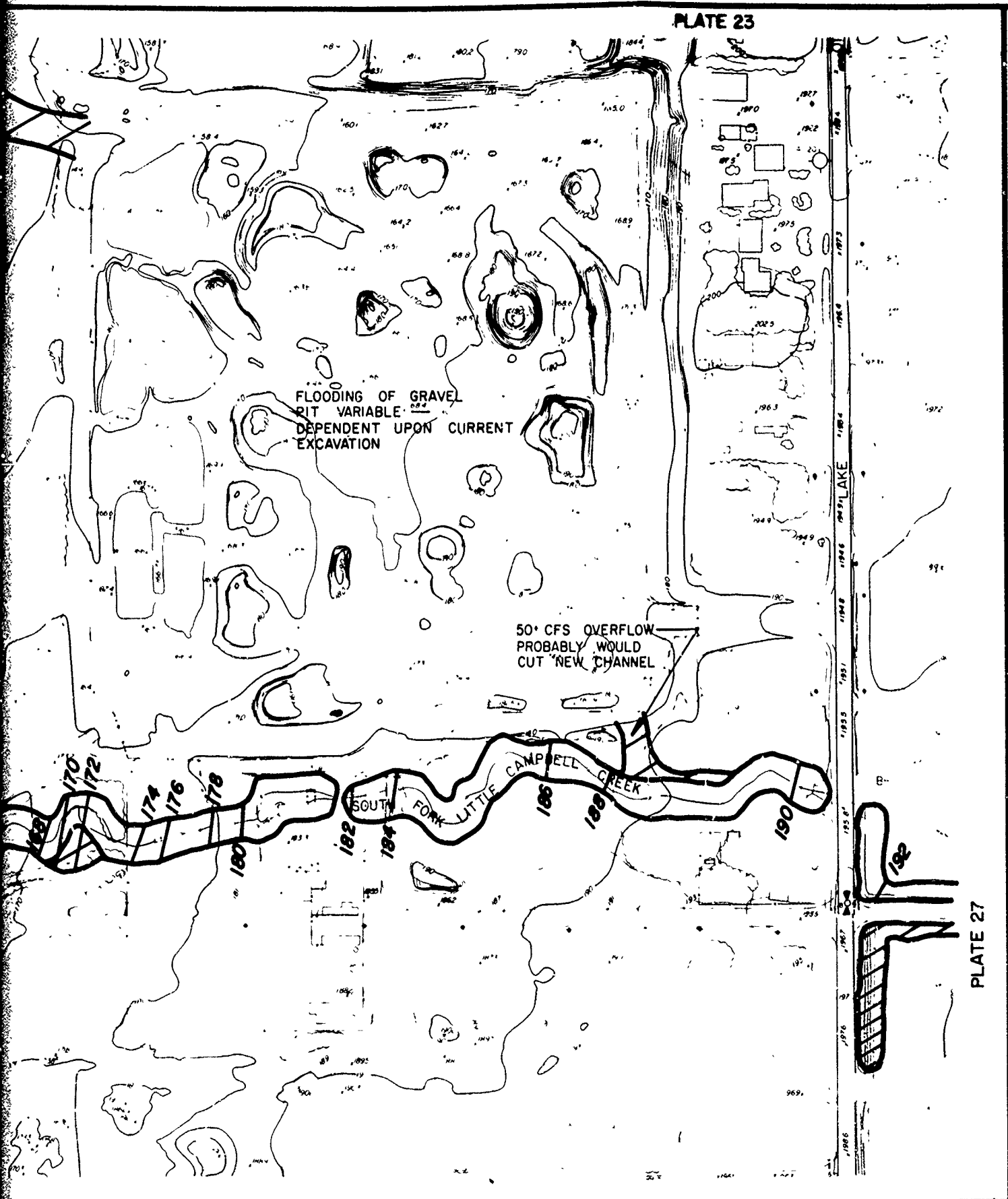
ANCHORAGE, ALASKA

MAY 1975

PLATE 25

PLATE 25





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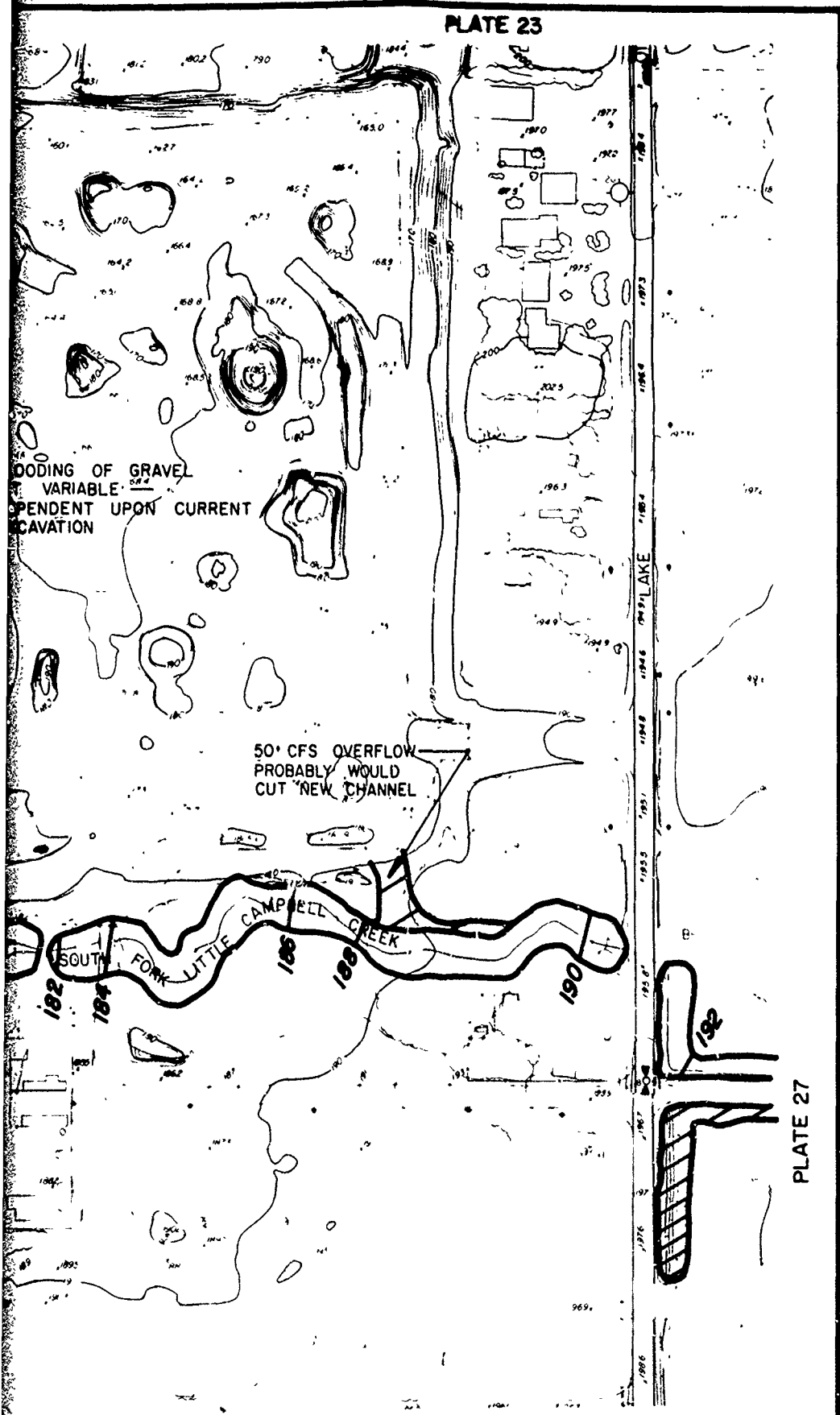

LEGEND

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—250— GROUND ELEVATION G.A.A.B. POST QUAKE DATUM (MSL 1972)

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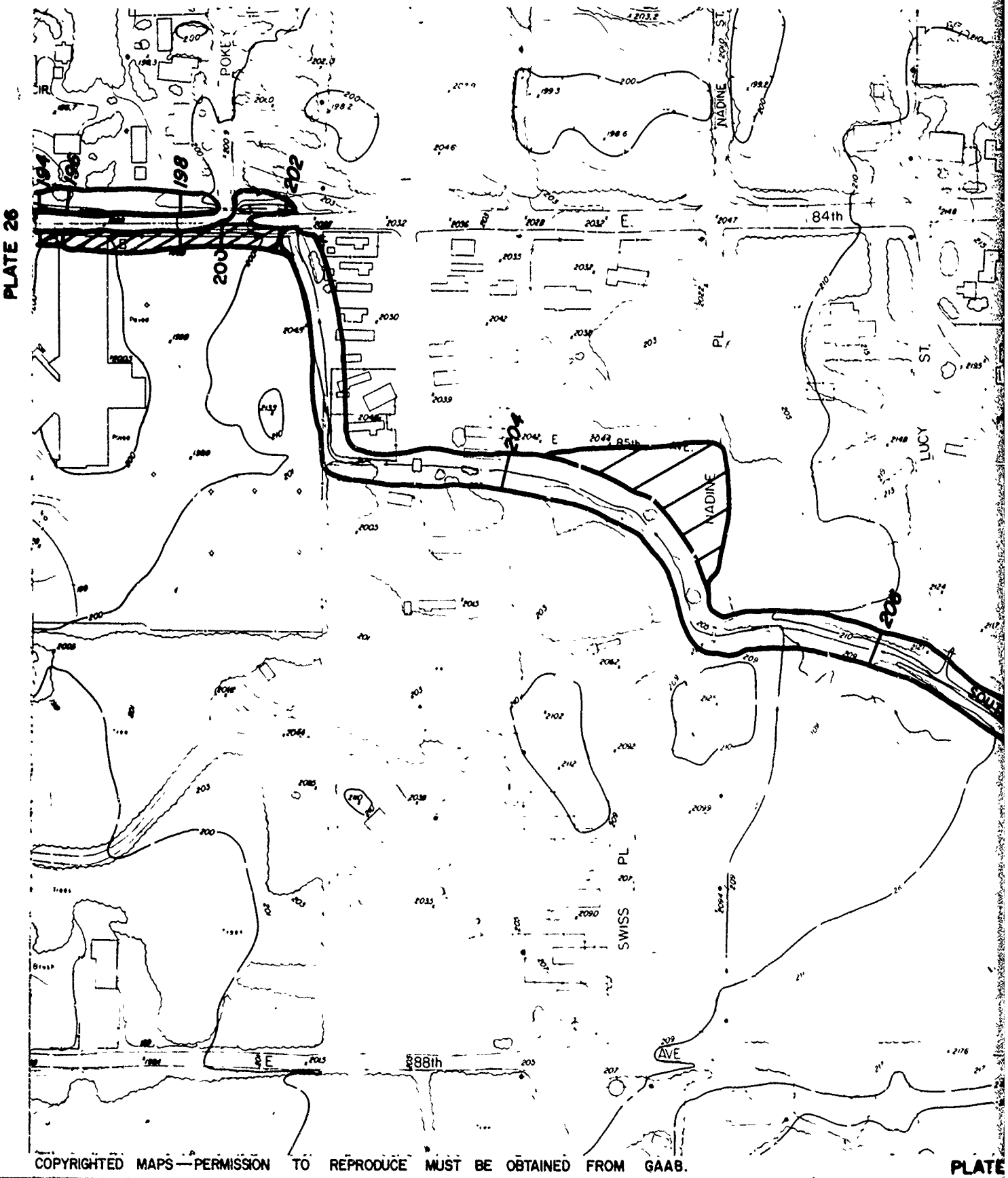

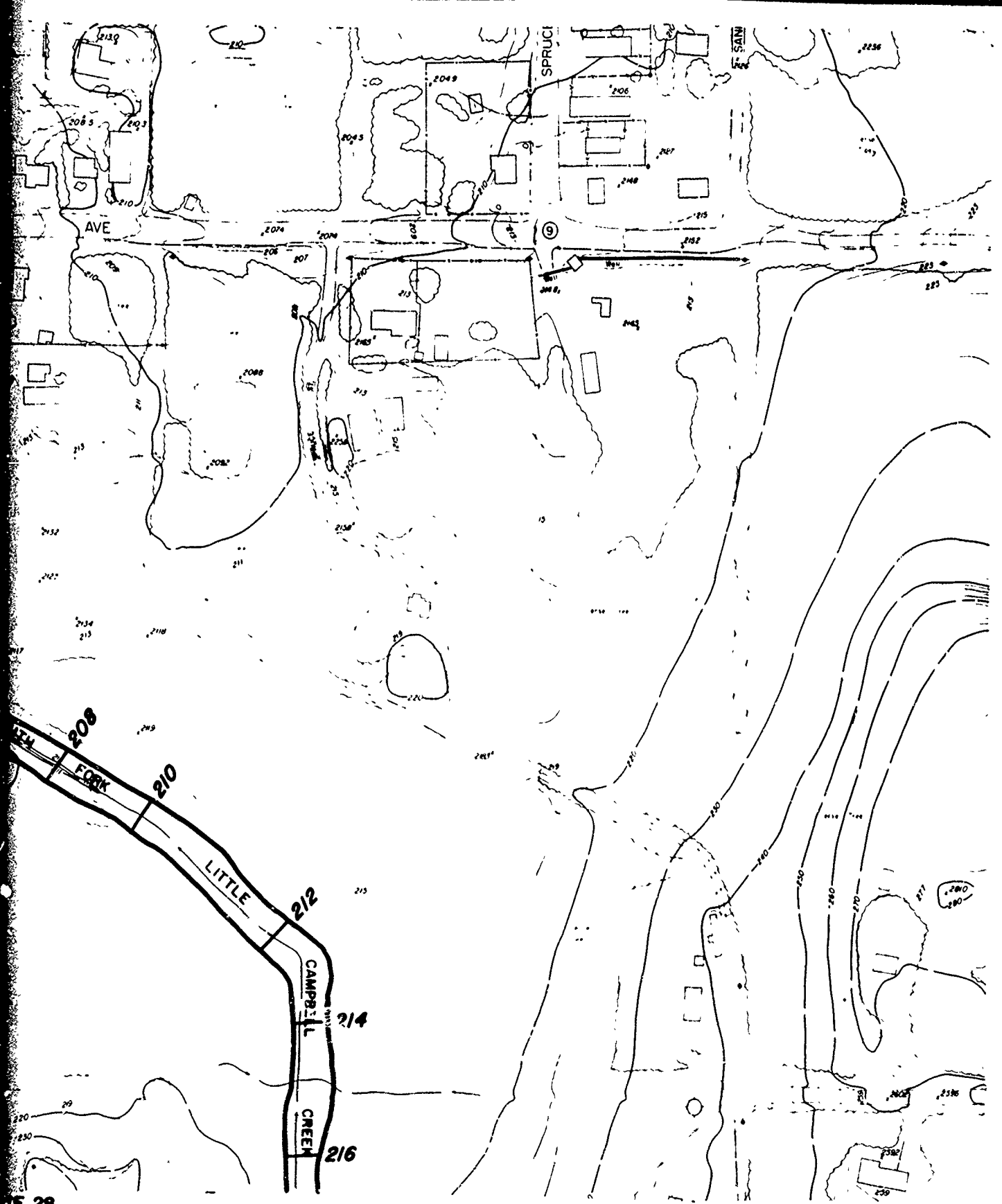

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OVERFLOW LIMITS

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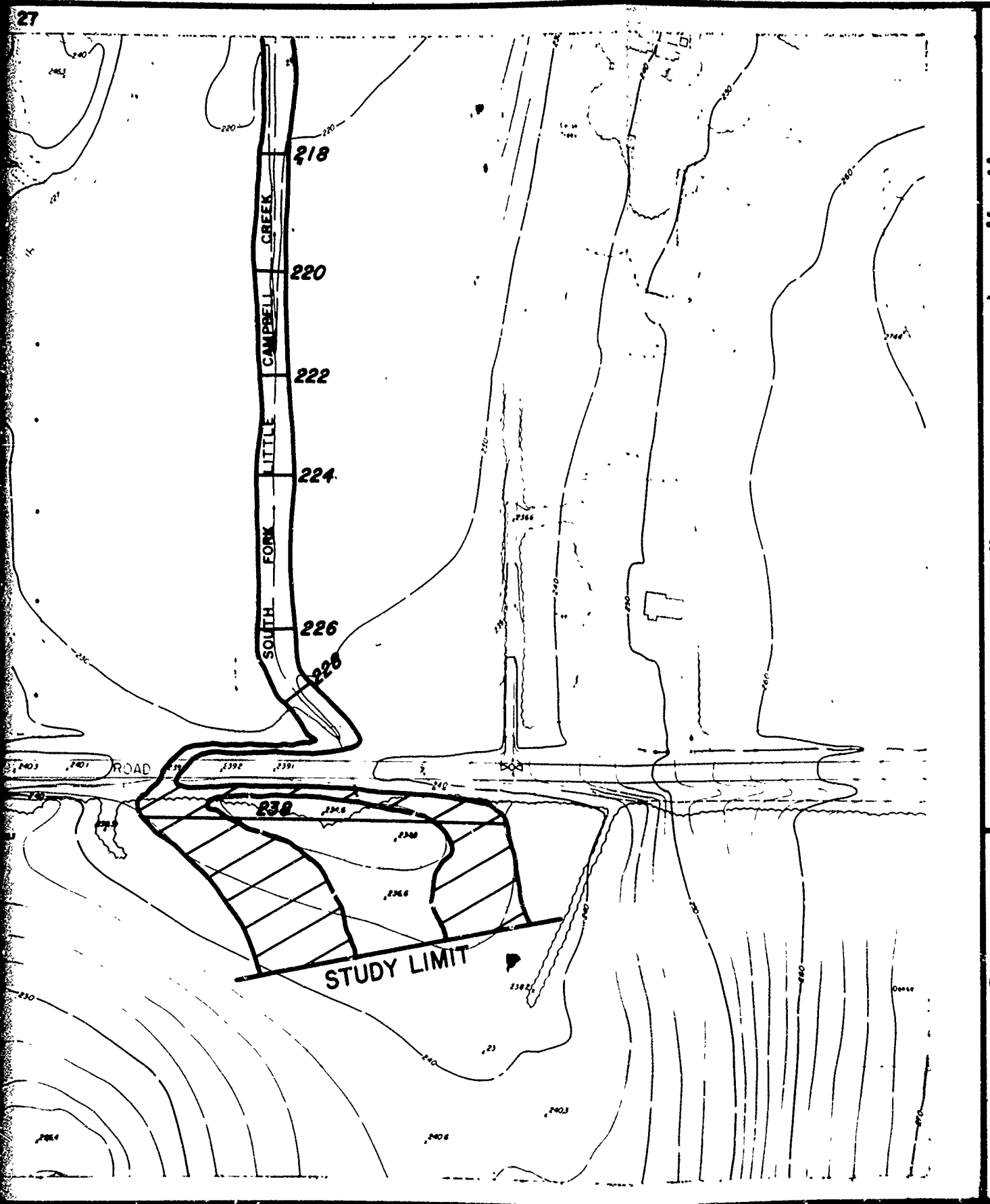
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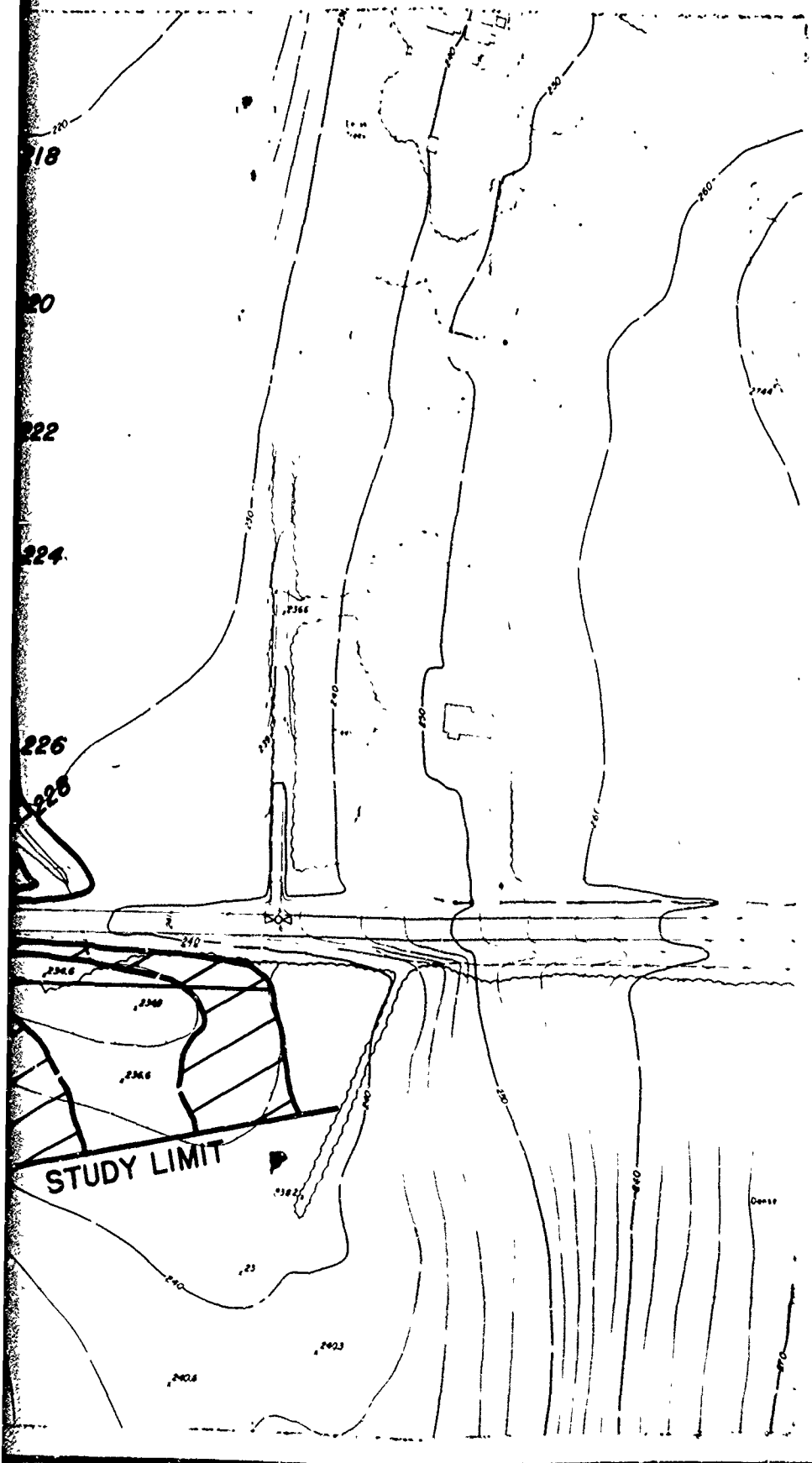

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PLATE 28